Snohomish County Drainage Manual

Volume I
Minimum Technical Requirements

~~November 2017~~July 2020 Ecology Review DRAFT

Table of Contents

Table of Contents, continued

Chapter 4 - BMP and Facility Selection Process for Permanent Stormwater Control Plans
42~~39~~

Table of Contents, continued

Tables

Figures

Chapter 1 - Introduction

1.1 Background and Objective

1.1.1 Background

The Snohomish County Drainage Manual is one of the three main components of the ~~County~~~~C~~county's stormwater regulations developed to meet the requirements of the 2019~~3~~ National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit. The other two components are relevant chapters of Snohomish County code (primarily Chapters 30.63A and 30.63B SCC) and the Snohomish County Engineering Design and Development Standards (EDDS).

~~The primary difference between this Drainage Manual and the previous version is an expansion of requirements related to low impact development (LID), mostly focusing on requirements for on-site stormwater management (see Volume I, Minimum Requirement 5). Other important changes include a revised hydrologic model (WWHM2012), a fundamentally different way to account for stormwater impacts to wetlands (see Volume I, Appendix I-D), and revisions to design requirements for a number of stormwater best management practices (BMPs) including bioretention, rain gardens, and stormwater infiltration systems.~~

1.1.2 Stormwater and Low Impact Development

Low impact development (LID) is a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design. The goal of LID is to prevent measurable physical, chemical or biological degradation to streams, lakes, wetlands, and other natural aquatic systems from occurring as a result of development activity on commercial, residential or industrial ~~development~~ sites.

This manual and Snohomish County's drainage and land-disturbing activity codes operate at the project scale. At that scale, and from the perspective of drainage engineering and plan review, stormwater LID and conventional stormwater management have a fair amount in common. Stormwater LID relies heavily on infiltration of water into soil, which is well understood and incorporated into both conventional stormwater facilities (such as infiltration ponds) and LID facilities and materials (such as bioretention systems and permeable pavement).

There is much discussion of the need for incorporating stormwater LID into watershed-scale actions such as land use planning. The Drainage Manual is not invoked in watershed-scale land use planning, but even at the project scale there are opportunities to incorporate concepts of LID at the project planning and early design decision processes. Doing so could provide a considerable departure from conventional stormwater management. For example, decisions about where to locate a building on a lot and decisions about other land surfaces that will be installed can affect the feasibility of installing on-site stormwater infiltration or dispersion trenches. Such decision processes are within the scope of "site-scale" regulations such as a drainage code, but a given decision process could drive quite different outcomes depending on how the decisions within it are sequenced.

1.1.3 Objective of this Manual

The objective of this manual is to set forth requirements for identifying, selecting, designing, and implementing stormwater management best management practices (BMPs) required by Snohomish County codes, primarily Snohomish County Code (SCC) Title 30 - Unified Development Code, Chapter 7.53 SCC - Water Pollution Control, and Chapter 7.54 SCC – Maintenance of Constructed Stormwater Control Facilities. This manual also provides additional non-binding guidance and recommendations on these BMPs. The requirements set forth in this manual apply within the unincorporated area of Snohomish County.

If any conflict exists between the requirements or definitions in this manual and those set forth in applicable chapters of ~~County~~county code, the requirements and definitions in the code shall control. Similarly, if any conflict exists between the requirements or definitions of Snohomish County Engineering Design and Development Standards (EDDS) and this manual, the requirements and definitions of the EDDS shall control.

The purpose of the stormwater management BMPs contained in this manual is to control the quantity and quality of stormwater discharges produced by new development, redevelopment, and activities at currently-developed properties, such that the discharges comply with state water quality standards and do not impair beneficial uses of the receiving waters. The state water quality standards include: Chapter 173-200 WAC, Water Quality Standards for Ground Waters of the State of Washington; Chapter 173-201A, Water Quality Standards for Surface Waters of the State of Washington; and Chapter 173-204, Sediment Management Standards.

This manual may also be helpful in identifying options for retrofitting BMPs as mitigation in areas of existing development. Stand-alone retrofitting projects may or may not fit neatly into the criteria and decision processes set forth in this manual. The developer is responsible in all cases to determine all applicable code and manual requirements.

It is not the intent of this manual to preclude alternative engineering solutions to design situations. It is expected that the professional engineer will bring to each project the best of his/her skills and abilities to see that the project is thoroughly analyzed and designed correctly, accurately, and in compliance with generally accepted engineering practices. Alternatives to standard plans, specifications, and design details found in this manual will be accepted if they meet or exceed the performance of these standards as determined by the county. Engineers are encouraged to be innovative. The burden of proof, however, is on the engineer to document that his/her innovations meet or exceed the performance of the standards.

This manual is based on the premise that development and redevelopment shall not negatively impact adjacent and/or downstream property owners, nor degrade groundwater or the natural drainage system, including but not limited to streams, ravines, wetlands, potholes, and rivers. Further, development activities should not impact adjacent and/or downstream property owners in a detrimental manner compared to the predeveloped condition.

It is not the intent of this manual to make Snohomish County a guarantor or protector of public or private property with regard~~s~~ to land development activities. Through this manual, Snohomish County is complying in part with the National Pollutant Discharge Elimination System (NPDES) Phase 1 municipal stormwater permit. Where requirements in this document are also covered in any other law, ordinance, resolution, rule or regulation of any kind the more restrictive law shall govern.

1.2 Organization of the Snohomish County Drainage Manual

The Snohomish County Drainage Manual is divided into ~~five~~ six volumes.

Volume I of this manual describes the requirements of Snohomish County code (SCC) that are satisfied by the use of this manual, including a detailed description of the nine Minimum Requirements set forth in Chapter 30.63A SCC. Volume I also sets forth the processes to determine appropriate BMPs to meet these requirements, and contains additional information and requirements referenced by Snohomish County code.

Volume II contains BMPs for stormwater management during and immediately following the period of construction or land disturbance. These BMPs are typically referred to as erosion and sedimentation control BMPs, or ESC BMPs.

Volume III contains hydrologic analysis methods and BMPs to control flow volumes from developed sites. These BMPS are typically referred to as flow control BMPs.

Volume IV contains BMPs to prevent or minimize pollution generated by potential pollution sources at developed sites. These BMPs are typically referred to as source control BMPs.

Volume V contains BMPs to treat runoff that contains sediment or other pollutants from developed sites. These BMPs are typically referred to as treatment BMPs. Volume V also contains maintenance requirements applicable to all flow control and treatment BMPs.

Volume VI contains specific maintenance standards for the stormwater flow control and treatment BMPs presented in Volumes III and V.

1.3 Organization of Volume I

Chapter 1 of this volume explains the contents of the volume and presents additional general information about stormwater, best management practices, and state and federal regulations that may apply to construction projects in Snohomish County. (~~n~~Note: S~~s~~tate and federal regulations are not administered by the ~~County~~county.)~~.~~

Chapter 2 of this volume describes the Minimum Requirements for stormwater control and site development for all new development and redevelopment in the county, as required in SCC 30.63A.300 and SCC 30.63A.310. This chapter also provides additional explanatory information about how to determine the requirements applicable to any particular land disturbing activity or development project.

Chapter 3 contains detailed information about the preparation of Stormwater Site Plans.

Chapter 4 contains detailed information about the selection of flow control and stormwater treatment BMPs that may be required.

Specific information about the design, ~~and~~ construction, and maintenance of required BMPs is contained in ~~volumes~~ Volumes II through VI of this manual.

Appendices are included to support these topics.

1.4 How to Use this Manual

People who are applying to Snohomish County for a land development permit or drainage plan approval should read all of Chapter 1 and Chapters 2.1 through 2.4 of this volume~~,~~ in order to

determine the Minimum Requirements applicable to the proposed project. Having determined the applicable requirements, applicants should read the chapters of this volume and Volumes II through V related to these requirements to determine the BMPs that will be used for the project.

Modifications and waivers of the requirements of this manual may be approved by Snohomish County according to SCC 30.63A.830 through SCC 30.63A.842.

People who are required by Chapter 7.53 SCC to implement source control BMPs at sites with existing development should read Volume IV and, for the control of erosion and sediment pollution, Volume II. People who are required by Chapter 7.54 SCC to inspect and maintain their stormwater flow control or treatment facilities should refer to Volume V, Chapter 4.6, and Volume VI.

The Snohomish County Department of Planning and Development Services website has information on the county's land use permitting process, including online permit information. Permit information can also be obtained by calling 425-388-3411~~,~~ or visiting the Planning and Development Services Permit Counter at 3000 Rockefeller Ave, Second Floor, Everett WA.

1.5 Development of Best Management Practices for Stormwater Management

1.5.1 Best Management Practices (BMPs)

Adverse impacts of development and redevelopment are prevented or minimized through the application of Best Management Practices (BMPs). BMPs are defined in Chapter 7.53 SCC as physical objects, structures, managerial practices, or behaviors, that, when used singly or in combination, eliminate or reduce the introduction of contaminants to stormwater, receiving waters, or groundwater. They are defined in Chapter 30.91 SCC as physical, structural, or managerial practices which have gained general acceptance for their ability to prevent or reduce public safety impacts and other environmental impacts, and which are adopted in the Snohomish County Drainage Manual, or approved by the director of Snohomish County ~~p~~Planning and D~~d~~evelopment S~~s~~ervices.

Generally speaking, BMPs can be categorized as erosion control BMPs, flow control BMPs, source control BMPs, and treatment BMPs. BMPs that involve construction of engineered structures are often referred to as facilities in this manual. For instance, the BMPs referenced in the menus of Volume V, Chapter 3 are called treatment facilities.

The primary purpose of using BMPs is to protect beneficial uses of water resources through the reduction of pollutant loads and concentrations, and through reduction of discharges (volumetric flow rates) causing stream channel erosion.

1.5.2 Source Control BMPs and Erosion and Sedimentation Control BMPs

Source control BMPs are defined specifically in Chapter 7.53 SCC as structures, equipment, supplies, or operations that are intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. Source control BMPs to be used for compliance with Chapter 7.53 SCC and Chapter 30.63A SCC are set forth in Volume IV of this manual. Historically, erosion and sedimentation control (ESC) BMPs have been kept as a separate class, probably due to the fact

that they have been required primarily through the regulation of construction and land development. However, many ESC BMPs are essentially source controls for a particular pollutant (sediment). Alternatively, a single BMP (such as covering exposed or stockpiled soil with mulch) could be considered an ESC BMP at a construction site and a source control BMP at an existing developed site with exposed soil.

1.5.3 Treatment BMPs

Treatment BMPs include facilities that remove pollutants by processes such as sedimentation, adsorption, filtration, biological uptake, and phytoremediation. Treatment BMPs can accomplish significant levels of pollutant load reductions if properly designed and maintained.

1.5.4 Flow Control BMPs

Flow control BMPs typically control the rate, frequency, and flow duration of stormwater surface runoff. The need to provide flow control BMPs depends on the size and type of the proposed project. Generally speaking, the amount of impervious surface in a development is the biggest factor in determining the amount of runoff generated. The primary means of controlling the stormwater flow that is generated are detention (slowing the flow rate of surface runoff), infiltration, and, to a lesser degree, evapotranspiration.

The concept of detention is to collect runoff from a developed area and release it at a slower rate than it enters the collection system. The reduced release rate requires temporary storage of the stormwater generated from the developed area. The volume of storage needed is dependent on 1) the size of the drainage area; 2) the extent of disturbance of the natural vegetation, topography, and soils and creation of effective impervious surfaces (surfaces that drain to a stormwater collection system); and 3) how rapidly the water is allowed to leave the detention pond~~,~~ (i.e., the target release rates).

The detention design standard in this manual is called a "flow duration" standard. Instead of matching the pre-development and post-development peak stormwater flow rates related to rainstorms of certain recurrence intervals, the flow duration standard requires matching, for predevelopment and post-development conditions, the amount of time (the duration) at which specific flow rates are exceeded. For example, if one of the specific flow rates for a project is 100 gallons per minute, and modeling with many years of rainfall records indicated that this flow rate was exceeded 10% of the time in the predevelopment condition, the detention facility would need to be designed so that flow from the development does not exceed this duration statistic.

The size of flow control facilities can be reduced by reducing the extent to which native vegetation and soil on a site are disturbed, reducing the amount impervious surface included in the development, and using low impact development (LID) BMPs. Some LID BMPs are included in this manual, and others can be incorporated into projects in Snohomish County provided that code requirements and standards are met.

1.5.5 Low Impact Development (LID) BMPs

Low impact development (LID) is the preferred and commonly-used approach to land development in Snohomish County. To this end, the Drainage Manual contains a number of LID BMPs, which are distributed stormwater management practices, to be integrated into project

design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration.

LID BMPs are used in various steps in the process of developing a Stormwater Site Plan for a development project. Some of the LID BMPs must be considered if the designer is using the "BMP list" approach for compliance with Minimum Requirement 5 – On-Site Stormwater Management. In addition, most of the LID BMPs can be used to comply with Minimum Requirement 6 (Runoff Treatment), Minimum Requirement 7 (Flow Control), or both. Finally, some of the LID BMPs may provide ancillary treatment or flow control benefits even if they do not specifically contribute to compliance with Minimum Requirements 6 or 7.

Table 1.0 presents the LID BMPs found in this manual, and for each BMP states whether it can be used to comply partially or fully with Minimum Requirement 6 (Runoff Treatment) or Minimum Requirement 7 (Flow Control), and whether it may provide ancillary treatment or flow control benefit even if it cannot be used to comply with Minimum Requirements 6 or 7. Section 2.5.5 of this volume sets forth the decision process for Minimum Requirement 5 and the BMPs that must be considered for compliance with that requirement. Detailed information for BMPs T5.10A, T5.10B, and T5.10C is presented in Volume III, Chapter 3 of this manual; detailed information for all other BMPs in Table 1.0 is presented in Volume V, Chapter 5.

It should be noted that the Minimum Requirement 5 credit for LID BMPs shown in Table 1.0 only applies to the BMP list approach for compliance with this requirement. In this approach the designer selects particular LID BMPs from a list using a prescribed decision process. Alternatively, using the "hydrologic performance standard" approach, the designer achieves a specific post-development flow control standard through using LID BMPs but without constraint on the specific LID BMPs chosen. The hydrologic performance standard approach may be used to comply with Minimum Requirement 5 for all projects to which the requirement applies. The BMP list approach is restricted to use on projects to which only Minimum Requirements 1 – 5 apply, or on projects to which Minimum Requirements 1 – 9 apply and which take place within an Urban Growth Area or outside an Urban Growth Area on a parcel less than 5 acres. Section 2.5.5 of this volume sets forth the details of both of these approaches.

Table 1.0

Minimum Requirement credit and ancillary benefits of LID BMPs

BMP	Minimum Requirement (MR) Credit			Additional benefits / Comments
	On-site (MR 5 list approach)	Runoff treatment (MR 6)	Flow control (MR 7)	
BMP T5.10A Downspout Full Infiltration Systems	Yes	No	Yes	Use restricted to residential roofs classified as non-pollution generating. Runoff from pollution-generating roofs must be routed through full dispersion or bioretention designed to meet MR 5, with overflow routed to a treatment system designed to meet MR 6.
BMP T5.10B Downspout Dispersion Systems	Yes	No	Yes	Use restricted to residential roofs classified as non-pollution generating. Runoff from pollution-generating roofs must be routed through full dispersion or bioretention designed to meet MR 5, with overflow routed to a treatment system designed to meet MR 6.
BMP T5.10C Perforated Stubout Connections	Yes	No	No	Use restricted to residential roofs classified as non-pollution generating. Runoff from pollution-generating roofs must be routed through full dispersion or bioretention designed to meet MR 5, with overflow routed to a treatment system designed to meet MR 6.
BMP T5.11 Concentrated Flow Dispersion	Yes	No	Yes	Could provide ancillary runoff treatment benefit.
BMP T5.12 Sheet Flow Dispersion	Yes	No	Yes	Could provide ancillary runoff treatment benefit.
BMP T5.13 Post-Construction Soil Quality and Depth	Yes	No	Yes	Could provide ancillary runoff treatment benefit.
BMP T5.14A Rain Gardens	Yes	No	No	Could provide ancillary runoff treatment and flow control. Use to satisfy MR 5 is restricted to projects where MRs 6-9 do not apply.
BMP T5.14B Bioretention for On-site Stormwater Management	Yes	No	Yes	Could provide ancillary runoff treatment benefit.

Table 1.0, continued

Minimum Requirement credit and ancillary benefits of LID BMPs

BMP	Minimum Requirement (MR) Credit			Additional benefits / Comments
	On-site (MR 5 list approach)	Runoff treatment (MR 6)	Flow control (MR 7)	
BMP T7.30 Bioretention (without underdrain)	Yes	Yes	Yes	
BMP T7.30 Bioretention (with underdrain)	No	Yes	Yes	If the underdrain is elevated within a base course of gravel, the bioretention facility will also provide some modest flow reduction benefit that will help achieve MR 7.
BMP T7.30 Bioretention (with underdrain and liner)	No	Yes	No	Could provide ancillary flow control benefit.
BMP T5.15 Permeable Pavement (without underdrain)	Yes	Yes	Yes	Additional treatment medium required under pavement if native soil does not provide treatment and pavement system is intended as treatment method.
BMP T5.15 Permeable Pavement (with underdrain elevated within base course)	Yes	No	Yes	Could provide ancillary runoff treatment benefit.
BMP T5.15 Permeable Pavement (with underdrain at or near bottom of base course)	No	No	Yes	Could provide ancillary runoff treatment benefit. Flow control benefit applies to MR 5 compliance if hydrologic performance standard approach is used.
BMP T5.30 Full Dispersion	Yes	Yes	Yes	
BMP T5.16: Tree Retention and Tree Planting	No	No	Yes	Flow control benefit applies to MR 5 compliance if hydrologic performance standard approach is used.
BMP T5.17: Vegetated Roofs	No	No	Yes	Feasibility of this BMP is not dependent on soil permeability or adequate depth to groundwater. Flow control benefit applies to MR 5 compliance if hydrologic performance standard approach is used.
BMP T5.18: Reverse Slope Sidewalks	No	No	Yes	Flow control benefit applies to MR 5 compliance if hydrologic performance standard approach is used.
BMP T5.19: Minimal Excavation Foundations	No	No	Yes	Flow control benefit applies to MR 5 compliance if hydrologic performance standard approach is used.

Table 1.0, continued

Minimum Requirement credit and ancillary benefits of LID BMPs

BMP	Minimum Requirement (MR) Credit			Additional benefits / Comments
	On-site (MR 5 list approach)	Runoff treatment (MR 6)	Flow control (MR 7)	
BMP T5.20: Rainwater Harvesting	No	No	Yes	Feasibility of this BMP is not dependent on soil permeability or adequate depth to groundwater. Flow control benefit also applies to MR 5 compliance if hydrologic performance standard approach is used.
BMP T5.40: Preserving Natural Vegetation	No	No	No	Use of this BMP inherently reduces the amount of mitigation needed to meet these requirements of MRs 5, 6, and 7. "Preserve natural vegetation (especially forested areas) as much as possible" is one of the design principles required in preparation of the Stormwater Site Plan to meet MR 1, as described in Volume I Chapter 3 of this manual.
BMP T5.41: Better Site Design	No	No	No	No credit for compliance with MRs 5, 6, or 7, although use of this BMP inherently reduces the amount of mitigation needed to meet these requirements. The first three design guidelines in BMP T5.41 are required principles in developing the Stormwater Site Plan in accordance with Volume I, Chapter 3 of this manual.

1.6 Relationship of this Manual to Federal and State Regulatory Requirements

1.6.1 Introduction

This section describes some of the federal and state regulations and permits that may apply to a project depending on the nature of the project and site characteristics. Snohomish County does not have a direct role in implementing these regulations or permits, but county staff may be able to assist members of the public in determining the applicable regulations or permits apply and providing contact information for the appropriate regulatory agencies. Snohomish County has attempted to tailor its regulatory and permit requirements to match those of similar federal and state regulations and permits.

For some projects, the Joint Aquatic Resources Permit Application (JARPA) may streamline the environmental permitting process. As noted in the following sections, several of the permits described in this section are included in the JARPA, so they can be covered under a single permit application. Refer to the Access Washington e-permitting website for more information.

1.6.2 More Stringent Measures

Federal and state agencies may impose additional or more stringent BMPs to meet state water quality standards or other established natural resource or drainage objectives, such as those established in Total Maximum Daily Loads (TMDLs) and pursuant Water Cleanup Plans.

1.6.3 Retrofitting

This Manual is not a retrofit manual, but it can be helpful in identifying options for retrofitting BMPs in areas or sites with existing development. Retrofitting stormwater BMPs into existing developed areas may be necessary to meet federal Clean Water Act and state Water Pollution Control Act (Chapter 90.48 RCW) requirements. In retrofit situations there frequently are site constraints that make the strict application of BMPs difficult. In these instances, the BMPs presented here can be modified using best professional judgment to provide reasonable improvements in stormwater management.

1.6.4 NPDES Industrial Stormwater General Permit

Many businesses in Snohomish County are subject to the NPDES Industrial Stormwater General Permit. Information about this permit may be obtained on the Washington State Department of Ecology.

This permit requires preparation and implementation of a Stormwater Pollution Prevention Plan. The BMPs in Volume IV of this manual should be adequate for compliance with the industrial stormwater permit, but operators of businesses subject to that permit should verify requirements of that permit with Ecology.

1.6.5 NPDES Construction Stormwater General Permit

Construction sites that disturb one acre or more and discharge stormwater from the project site to surface water are regulated by the NPDES Construction Stormwater General Permit.

Information about this permit may be obtained from the Washington State Department of Ecology.

As with the industrial stormwater permit discussed in Section 1.6.4 above, the BMPs in this manual should be adequate for compliance with the construction stormwater permit, but operators of projects subject to that permit should verify requirements of that permit with Ecology.

1.6.6 Endangered Species Act

With the listing of multiple species of salmon as threatened or endangered across much of Washington ~~State~~state, and the probability of more listings in the future, implementation of the requirements of the Endangered Species Act may have a dramatic effect on urban stormwater management. Provisions of the Endangered Species Act that may apply directly to stormwater management include the Section 4(d) rules, Section 7 consultations, and Section 10 Habitat Conservation Plans (HCPs), which can affect the regulations of local governments and in some cases can be imposed on individual projects directly.

1.6.7 Section 401 Water Quality Certifications

For projects that require a fill or dredge permit under Section 404 of the Clean Water Act, Ecology must certify to the U.S. Army Corps of Engineers that the proposed project will not violate water quality standards. In order to make such a determination, Ecology may do a more specific review of the potential impacts of a stormwater discharge from the construction phase of the project and from the completed project. As a result of that review, Ecology may condition its certification to require:

- Application of the M~~m~~inimum R~~r~~equirements and BMPs in the latest version of its Stormwater Management manual; or
- Application of more stringent requirements.

1.6.8 Hydraulic Project Approvals (HPAs)

Under Chapter 77.55 RCW, the Hydraulics Act, the Washington State Department of Fish and Wildlife (DFW) has the authority to require actions when stormwater discharges related to a project would change the natural flow or bed of state waters. The implementing mechanism is the issuance of a Hydraulics Project Approval (HPA). In exercising this authority, DFW may require:

- Compliance with the provisions of the latest version of Ecology's Stormwater Management Manual; or
- Application of more stringent requirements that DFW determines are necessary to meet their statutory obligations to protect fish and wildlife.

1.6.9 Aquatic Lands Use Authorizations

The Department of Natural Resources (DNR), as the steward of public aquatic lands, may require a stormwater outfall to have a valid use authorization, and to avoid or mitigate resource impacts. Through its use authorizations, which are issued under authority of Chapters 79.90 through 96 RCW, and in accordance with Chapter 332-30 WAC, DNR may require:

- Compliance with the provisions of the latest version of Ecology's Stormwater Management Manual; or
- Application of more stringent requirements that they determine are necessary to meet their statutory obligations to protect the quality of the state's aquatic lands.

1.6.10 Underground Injection Control Authorizations

The Underground Injection Control (UIC) regulations of Chapter 173-218 WAC apply to stormwater infiltration systems, although those regulations contain exemptions for various kinds of stormwater infiltration systems. These regulations are implemented by the Washington State Department of Ecology, and Snohomish County recommends that the applicant contact that department for project-specific determinations about UIC regulation applicability.

Chapter 2 - Minimum Requirements for New Development and Redevelopment

Chapter 30.63A SCC sets forth nine Minimum Requirements for new development and redevelopment projects. Some projects are exempt or excepted from some of these requirements, as set forth in Chapter 30.63A SCC Part 200.

The Minimum Requirements are:

1. ~~1)~~ P~~p~~reparation of a stormwater site plan
2. ~~2)~~ S~~s~~tormwater pollution prevention plan (SWPPP)
3. ~~3)~~ W~~w~~ater pollution source control for new development or redevelopment activities
4. ~~4)~~ P~~p~~reservation of natural drainage systems or outfalls and provision of off-site mitigation
5. ~~5)~~ O~~o~~n-site stormwater management
6. ~~6)~~ R~~r~~unoff treatment
7. ~~7)~~ F~~f~~low control requirements for new development or redevelopment
8. ~~8)~~ S~~s~~tormwater discharges to wetlands
9. ~~9)~~ I~~i~~nspection, operation and maintenance requirements

Depending on the type and size of the proposed project, different combinations of these M~~m~~inimum R~~r~~equirements apply.

2.1 [Reserved]

2.2 Exemptions and exceptions

Chapter 30.63A SCC Part 200 sets forth exemptions from Minimum Requirements for some land disturbing activities and types of development projects. Some projects and activities are exempt from all Minimum Requirements, and others are exempt from selected portions of the Minimum Requirements and other related requirements of Chapter 30.63A SCC. The 2016 revisions to Chapter 30.63A include an exception from specific drainage requirements for certain projects that do not drain to the ~~County~~county's storm sewer system. People who are applying to Snohomish County for a land development permit or drainage plan approval should carefully read the referenced code sections to determine the applicable Minimum Requirements.

Supplemental information regarding exemptions for road maintenance activities

The following road maintenance practices are considered redevelopment, and therefore are not categorically exempt from Minimum Requirements. The extent to which the manual applies is explained for each circumstance.

- Removing and replacing a paved surface to base course or lower, or repairing the roadway base. If impervious surfaces are not expanded, -Minimum Requirements #1 - #5 apply. Where appropriate, project proponents are encouraged to look for opportunities to use permeable and porous pavements.

- Extending the pavement edge without increasing the size of the road prism, or paving graveled shoulders. These activities are considered new impervious surfaces and are subject to the Mminimum Rrequirements that are triggered when the thresholds identified for new or redevelopment projects are met.
- Resurfacing by upgrading from dirt to gravel, asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment ("chip seal") to asphalt or concrete. These activities are considered new impervious surfaces and are subject to the Mminimum Rrequirements that are triggered when the thresholds identified for new or redevelopment projects are met.

2.3 [Reserved]

2.4 Applicability of the Minimum Requirements

SCC 30.63A.300 and SCC30.63A.310 set forth the applicability of the Minimum Requirements to different types of development and redevelopment projects. For reference, these code sections are included as follows, with corresponding decision flow charts in Figure 1.1 for new development, Figure 1.2 for redevelopment, and Figure 1.3 for road-related projects. In the event of conflict between these flow charts and the code language, the code language shall take precedence. NOTE: The requirements of SCC 30.63A.310(5) applyies only to public road redevelopment projects, and does not apply to private road projects.

SCC 30.63A.300 Drainage review thresholds and requirements for new development.

(1) Regardless of the new development thresholds established below in SCC 30.63A.300(2) and (3), all new development shall be required to comply with minimum rRrequirement 2 (SCC 30.63A.445 and 30.63A.450), unless mMminimum rRrequirement 2 is not required for an exempted activity pursuant to SCC 30.63A.200. In addition, new development shall comply with any other applicable additional requirement specified in part 700 of this chapter.

(2) Unless an exception under SCC 30.63A.210 applies, new development projects shall comply with mMminimum rRrequirements 1 through 5 (SCC 30.63A.400 through 30.63A.525) for the new and replaced hard surfaces and the land disturbed if the new development will:
   (a) Result in or add 2,000 square feet or greater of new, replaced or new plus replaced hard surface area; or
   (b) Cause land disturbing activity of 7,000 square feet or greater.

(3) Unless an exception under SCC 30.63A.210 applies, new development projects shall comply with all mMminimum rRrequirements 1 through 9 (SCC 30.63A.400 through 30.63A.605) for the new and replaced hard surfaces and converted vegetation areas if the new development will:
   (a) Result in or add 5,000 square feet or more of new plus replaced hard surface area;
   (b) Convert three-quarters of an acre or more of vegetation to lawn or landscaped areas; or
   (c) Convert 2.5 acres or more of native vegetation to pasture.

SCC 30.63A.310 Minimum drainage review thresholds and requirements for redevelopment.

(1) Regardless of the redevelopment thresholds established below in SCC 30.63A.310(2) and (3) all redevelopment shall comply with minimum requirement 2 (SCC 30.63A.445 and SCC 30.63A.450) unless minimum requirement 2 is not required for an exempted activity pursuant to SCC 30.63A.200. In addition, redevelopment shall comply with any other additional applicable ~~redevelopment~~ requirement specified in part 700 of this chapter.

(2) Unless an exception under SCC 30.63A.210 applies, redevelopment projects shall comply with minimum requirements 1 through 5 (SCC 30.63A.400 through 30.63A.525) for the new and replaced hard surfaces and the land disturbed if the redevelopment will:

(a) Result in or add 2,000 square feet or greater of new, replaced or the total of new plus replaced hard surfaces; or

(b) Cause 7,000 square feet or more of land disturbing activity.

(3) Unless an exception under SCC 30.63A.210 applies, redevelopment projects shall comply with minimum requirements 1 through 9 (SCC 30.63A.400 through 30.63A.605) for the new hard surfaces and converted vegetation areas if the redevelopment will:

(a) Result in or add 5,000 square feet or more of new hard surface area;

(b) Convert three-quarters of an acre or more of vegetation to lawn or landscaped areas; or

(c) Convert 2.5 acres or more of native vegetation to pasture.

(4) ~~The director may allow the minimum requirements to be met for an equivalent area of flow and pollution characteristics within the same site. For public road projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water.~~Minimum Requirements #5, #6, #7, and/or #8 may be met for an area within a TDA by providing flow control or treatment capacity for an area of equivalent flow and pollution characteristics within the same TDA. The equivalent area does not have to be within the same TDA or project limits, but must drain to the same receiving water, and the guidance for equivalent facilities using in-basin transfers must be followed in Appendix I-D.6 Regional Facility Area Transfers in Volume I of the 2019 Ecology Stormwater Management Manual for Western Washington.

(5) In addition to the requirements in SCC 30.63A.310(1) through (4), for road-related redevelopment projects, runoff from the replaced and new hard surfaces (including pavement, shoulders, curbs and sidewalks) and the converted vegetation areas shall meet minimum requirements 1 through 9 (SCC 30.63A.400 through 30.63A.605) if the new hard surfaces total 5,000 square feet or more and total 50 ~~percent~~% or more of the existing hard surfaces within the project limits. The project limits shall be defined by the length of the project and the width of the right-of-way.

(6) In addition to the requirements in subsections ~~SCC 30.63A.310~~(1) through (4) of this section, all redevelopment projects, except road-related projects covered by subsection ~~SCC 30.63A.310~~(5) of this section, shall comply with minimum requirements 1 through 9 (SCC 30.63A.400 through 30.63A.605) for the new plus replaced hard surfaces and converted vegetation areas when:

(a) The total of the new plus replaced hard surfaces totals 5,000 square feet or more; and

(b) One of the following valuation criteria is met as applicable. For the purpose of meeting this valuation criteria, "commercial use" means a structure or site used for providing

goods, merchandise, or services for compensation, and "industrial use" means structures or sites used for the primary purposes of manufacturing, assembly, processing or storage of products or equipment:

(i) For projects that include commercial or industrial uses: the valuation of the proposed improvements, including interior improvements, exceeds 50% of the assessed value of the existing project site improvements as documented by the applicant; or

(ii) For projects other than commercial or industrial: t~~T~~he value of proposed improvements including interior improvements exceeds 50 ~~percent~~% of the assessed value of the existing site improvements as documented by the applicant.

Figure 1.1 Minimum Requirements (MR's) for New Development Projects

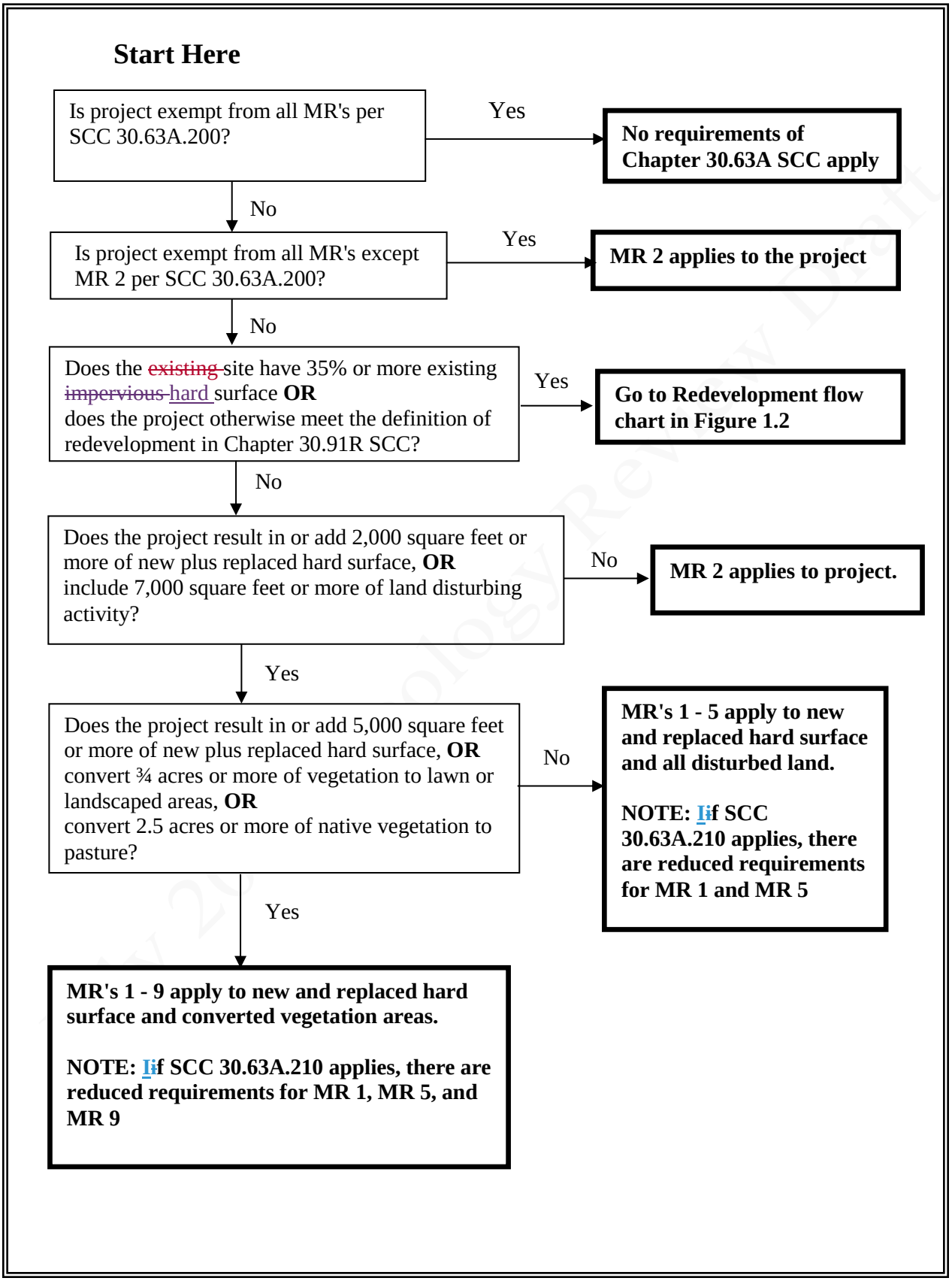


Figure 1.2 Minimum Requirements (MR's) for Redevelopment Projects
*** "road-related" refers only to public roads, not private roads**

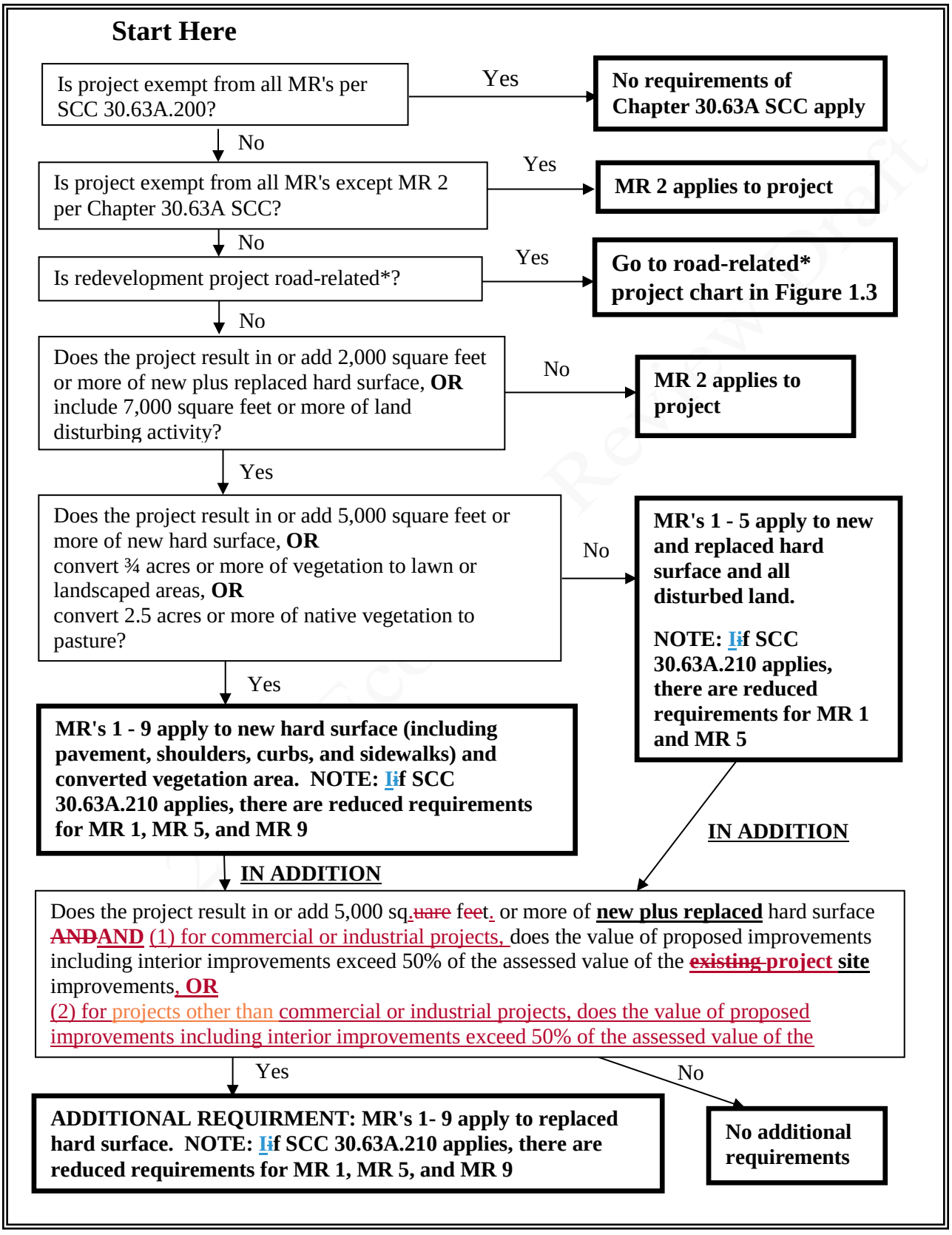
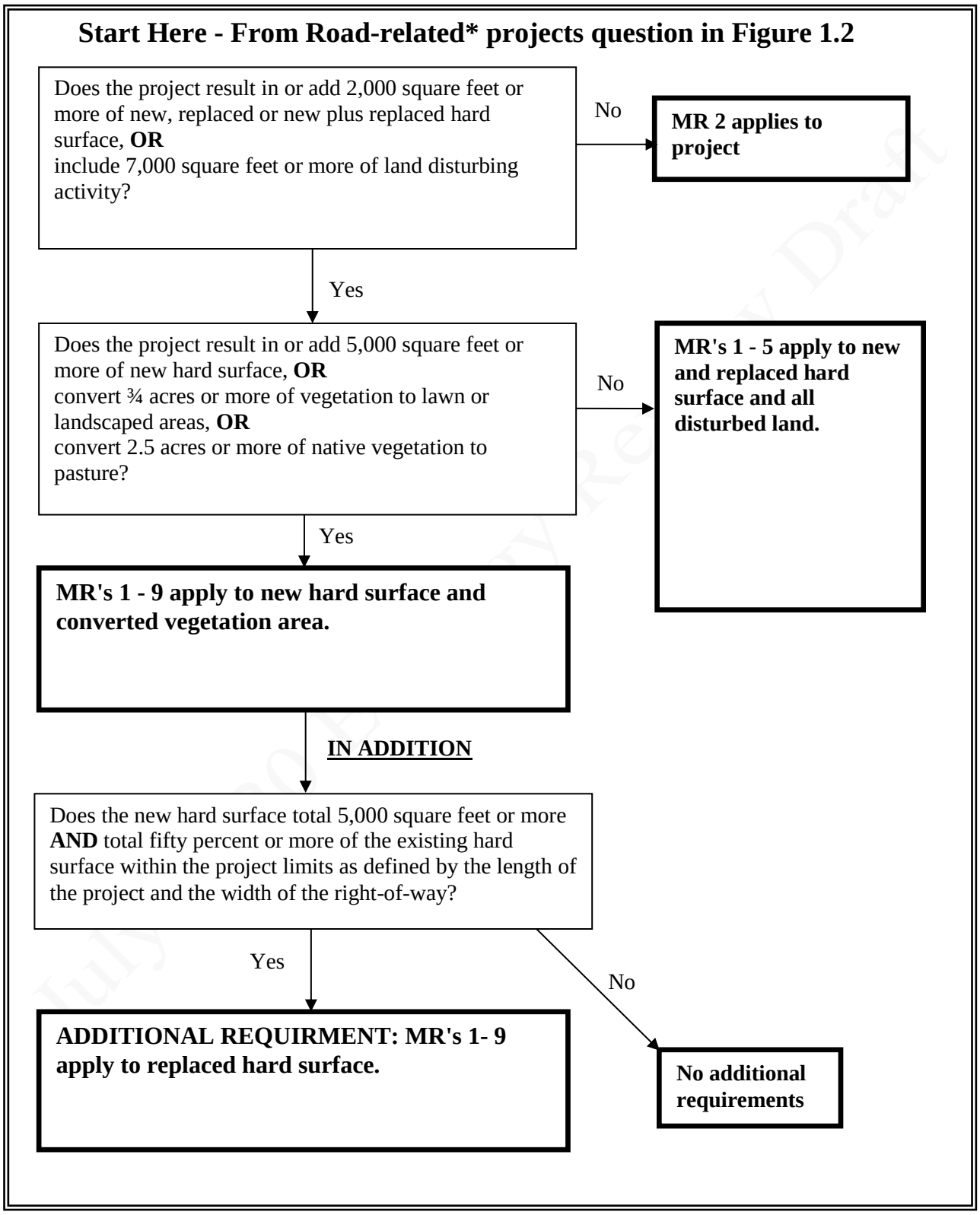


Figure 1.3 Minimum Requirements (MR's) for Road-related* Redevelopment Projects
*** "road-related" refers only to public roads, not private roads**



2.5 Minimum Requirements

Chapter 30.63A SCC Parts 400 through 600 and the remaining sections of this chapter establish Minimum Requirements for development and redevelopment projects.

2.5.1 Minimum Requirement 1: Preparation of Stormwater Site Plans

Chapter 3 contains the requirements for preparing Stormwater Site Plans.

2.5.2 Minimum Requirement 2: Stormwater Pollution Prevention Plans (SWPPPs)

Volume II, Chapter 3 contains the requirements for development and implementation of Stormwater Pollution Prevention Plans (SWPPPs).

2.5.3 Minimum Requirement 3: Source Control of Pollution

SCC 30.63A.515 contains requirements for water pollution source control for new development or redevelopment activities.

2.5.4 Minimum Requirement 4: Preservation of Natural Drainage Systems and Outfalls

SCC 30.63A.520 contains requirements for preservation of natural drainage systems or outfalls for all new development and redevelopment activities

2.5.5 Minimum Requirement 5: On-site Stormwater Management

SCC 30.63A.525 requires implementation of on-site stormwater BMPs in accordance with the following project thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible. NOTE: The requirements of Section 2.5.5 do not apply to projects that qualify for exceptions under SCC 30.63A.210. Applicants for those projects should read that code section carefully to determine applicable requirements.

Applicability

Projects that are exempt from Minimum Requirement 7 as set forth in Section 2.5.7 of this chapter do not have to achieve the LID performance standard, nor consider bioretention, rain gardens, permeable pavement, and full dispersion if using List #1 or List #2. However, those projects must implement the following BMPs if feasible:

- BMP T5.13 Post-Construction Soil Quality and Depth; and
- BMP T5.10A Downspout Full Infiltration Systems, BMP T5.10B Downspout Dispersion Systems, or BMP T5.10C Perforated Stub-out Connections; and
- BMP T5.11 Concentrated Flow Dispersion or BMP T5.12 Sheet Flow Dispersion.

Project thresholds

Projects triggering only Minimum Requirements #1 through #5 shall either:

- Use On-site Stormwater Management BMPs from List #1 for all surfaces within each type of surface in List #1; or

- Demonstrate compliance with the LID Performance Standard and apply BMP T5.13: Post-Construction Soil Quality and Depth. Projects selecting this option cannot use Rain Gardens. They may choose to use Bioretention BMPs as described in this manual.

Projects triggering Minimum Requirements 1 through 9 must meet the requirements in Table 1.1.

Table 1.1

On-site Stormwater Management Requirements for Projects Triggering Minimum Requirements 1 -9

UGA = Urban Growth Area as designated under Chapter 36.70A RCW

Project Type and Location	Requirement
New development on any parcel inside the UGA, or new development outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
New development outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.
Redevelopment on any parcel inside the UGA, or redevelopment outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
Redevelopment outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.

Low impact development performance standard

If required for the project or selected as the option for compliance with Minimum Requirement 5, stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the Standard Flow Control Requirement section in Chapter 2.5.7 (Minimum Requirement 7) for information about the assignment of the pre-developed condition. Projects that must also provide flow control in accordance with Minimum Requirement 7 shall match flow durations between 8% of the 2-year flow through the full 50-year flow.

List #1: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements 1 through 5

For each surface, consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. Feasibility shall be determined according to specific criteria set forth for each BMP as described in Volumes III and V of this manual, and based in part on the information in the Soils Report prepared as part of the required Stormwater Site Plan described Chapter 3 of this volume. If a BMP is determined to be feasible for a surface, no other on-site stormwater management BMP is necessary for that surface. An on-site stormwater management BMP shall not be required for a surface if it is determined that no BMP is feasible for that

surface. In addition, Snohomish County may remove or reduce the requirement for a BMP if its implementation will conflict with any of the following:

- Historic Preservation Laws and Archaeology Laws as listed at https://dahp.wa.gov/project-review/preservation-lawshttp://www.dahp.wa.gov/learn-and-research/preservation-laws;
- Federal Superfund or Washington State Model Toxics Control Act;
- Federal Aviation Administration requirements for airports;
- Americans with Disabilities Act;
- Sspecial zoning district design criteria adopted and being implemented pursuant to a community planning process;
- Public health and safety standards;
- Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way;
- Tree species protection standards in Chapter 30.62A SCC; or
- Regulations related to critical aquifer recharge areas, including wellhead protection areas, set forth in Chapter 30.62C SCC.

BMPs for lawn and landscaped areas:

1. Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Volume V, Chapter 5 of this manual.

BMPs for roofs:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Volume III, Chapter 3 of this manual.
2. Rain Gardens in accordance with BMP T5.14A in Volume V, Chapter 5 of this manual, or Bioretention in accordance with BMP T7.30 in Volume V, Chapter 7 of this manual.
3. Downspout Dispersion Systems in accordance with BMP T5.10B in Volume III, Chapter 3 of this manual.
4. Perforated Stub-out Connections in accordance with BMP T5.10C in Volume III, Chapter 3 of this manual.

BMPs for other hard surfaces:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual.
2. Permeable pavement in accordance with BMP T5.15 in Volume V, Chapter 5 of this manual, or Rain Gardens in accordance with BMP T5.14A in Volume V, Chapter 5 of this manual, or Bioretention in accordance with BMP T7.30 in Volume V, Chapter 7 of this manual. NOTE: This is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless full dispersion is employed.
3. Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Volume V, Chapter 5 of this manual.

List #2: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements 1 through 9

For each surface, consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. Feasibility shall be determined according to specific criteria set forth for each BMP as described in Volumes III and V of this manual, and based in part on the information in the Soils Report prepared as part of the required Stormwater Site Plan described Chapter 3 of this volume. If a BMP is determined to be feasible for a surface, no other on-site stormwater management BMP is necessary for that surface. An on-site stormwater management BMP shall not be required for a surface if it is determined that no BMP is feasible for that surface. In addition, Snohomish County may remove or reduce the requirement for a BMP if its implementation will conflict with any of the following:

- Historic Preservation Laws and Archaeology Laws as listed at https://dahp.wa.gov/project-review/preservation-lawshttp://www.dahp.wa.gov/learn-and-research/preservation-laws;
- Federal Superfund or Washington State Model Toxics Control Act;
- Federal Aviation Administration requirements for airports;
- Americans with Disabilities Act;
- special zoning district design criteria adopted and being implemented pursuant to a community planning process;
- Public health and safety standards;
- Transportation regulations to maintain the option for future expansion or multi-modal use of public rights-of-way; or
- Tree species protection standards in Chapter 30.62A SCC.

Lawn and landscaped areas:

1. Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Volume V, Chapter 5 of this manual.

Roofs:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual, or, for single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, Downspout Full Infiltration Systems in accordance with BMP T5.10A in Volume III, Chapter 3 of this manual.

2. Bioretention in accordance with Volume V, Chapter 7 of this manual.

3. For single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, Downspout Dispersion Systems in accordance with BMP T5.10B in Volume III, Chapter 3 of this manual.

4. For single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, Perforated

Stub-out Connections in accordance with BMP T5.10C in Volume III, Chapter 3 of this manual.

Other Hard Surfaces:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual.
2. Permeable pavement in accordance with BMP T5.15 in Volume V, Chapter 5 of this manual. NOTE: This is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless full dispersion is employed.
3. Bioretention in accordance with Volume V, Chapter 7 of this manual.
4. Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Volume V, Chapter 5 of this manual.

Additional Guidance:

As noted in Section 1.5.5 of this volume, the BMPs presented in this section as providing compliance with Minimum Requirement 5 using the list approach are a subset of a larger suite of BMPs in this manual that are often referred to as "low impact development" (LID) BMPs. Some of this larger suite of BMPs may be used to comply with Minimum Requirement 6 (Runoff Treatment) or Minimum Requirement 7 (Flow Control). In addition, some of these BMPs may provide ancillary treatment or flow control benefits even if they do not specifically contribute to compliance with Minimum Requirements 6 or 7. Table 1.0, presented in Section 1.5.5 of this volume, summarizes the uses and ancillary benefits of all LID BMPs contained in the Snohomish County Drainage Manual. Detailed information for BMPs T5.10A, T5.10B, and T5.10C is presented in Volume III, Chapter 3 of this manual; detailed information for all other BMPs in Table 1.0 is presented in Volume V, Chapter 5.

2.5.6 Minimum Requirement 6: Runoff Treatment

Stormwater treatment facilities shall be provided for each threshold discharge area in which the hard and pervious surfaces subject to this Mminimum Rrequirement (see SCC 30.63A.300 through 30.63A.310) meet the following criteria:

- Tthe total of pollution-generating hard surface (PGHS) in the threshold discharge area is 5,000 square feet or more; or
- Tthe total of pollution-generating pervious surfaces (PGPS) in the threshold discharge area, excluding permeable pavement, and from which stormwater will be discharged in a natural or man-made conveyance system from the site, is three-quarters (3/4) of an acre or more.

Stormwater from multiple threshold discharge areas can be treated in a single stormwater facility designed on the basis of the combined flows.

If stormwater treatment is required, use the procedures set forth in Volume I, Chapter 4, Section 4.2, Step 5 of this manual to determine the specific type of stormwater treatment facility required for the project. Design requirements for specific stormwater treatment facilities are set forth in Volume V of this manual. Volume V, Chapter 4, Section 4.1 provides requirements for design storm volumes and flow rates.

2.5.7 Minimum Requirement 7: Flow Control

Flow control is required as set forth below. If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both Minimum Requirement #7 and Minimum Requirement #8 apply.

Thresholds for requiring flow control

The requirements of this section apply to projects that discharge stormwater directly or indirectly through a conveyance system into a ~~fresh water system~~water body listed in Appendix I-E of this manual.

Unless excepted in this section, flow control shall be provided for applicable threshold discharge areas of projects as determined by the requirements of Chapter 2 of this volume.

Flow control shall be provided for projects that meet any of the following thresholds:

- T~~t~~he total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area;
- T~~t~~hree-quarters of an acre or more of native vegetation is converted to lawn or landscape and surface water is discharged from the site into a conveyance system or receiving waters;
- 2.5 acres or more of native vegetation are converted to pasture in a threshold discharge area and surface water is discharged from the site into a conveyance system or receiving waters; or
- A~~a~~ combination of hard surfaces and converted pervious surfaces cause a ~~0.1~~0.15 cubic feet per second (cfs) or greater increase in the 100-year flow frequency from a threshold discharge area as estimated using ~~the Western Washington Hydrology Model or other model approved by the Washington State Department of Ecology and Snohomish County,~~an approved continuous runoff hydrologic model and ~~one-hour~~15-minute time steps ~~(or a 0.15 cfs increase or greater using 15-minute time steps)~~. Approved continuous runoff hydrologic models are described in Volume III Chapter 2.1. The ~~0.10 cfs (one-hour time steps) or~~ 0.15 cfs ~~(15-minute time steps)~~ increase should be a comparison of the post-project runoff to the existing condition runoff. NOTE: For the purpose of applying the ~~0.10 cfs or~~ 0.15 cfs threshold~~s~~, the existing condition shall be the pre-project land cover, with the condition that Snohomish County may require the use of land cover documented for the site at an earlier date in accordance with the requirements of SCC 30.63A.845.

That portion of any project in which the above thresholds are not exceeded in a threshold discharge area shall include on-site stormwater management BMPs in accordance with M~~m~~inimum R~~r~~equirement 5 pursuant to SCC 30.63A.525.

Exceptions for flow control requirement

Flow control is not required for projects that discharge directly or indirectly through a municipal separate storm sewer system to a water listed in Volume I, Appendix I-E of this manual subject to the following restrictions:

- Any direct discharge shall not result in the diversion of drainage from any lake, wetland or stream classified as Type 1, 2, 3, or 4 in the State of Washington Interim Water Typing

System, or Type "S", "F", or "Np" in the Permanent Water Typing System, or from any Category I, II, or III wetland;

- Flow splitting devices or drainage BMPs shall be applied to route natural runoff volumes from the project site to any downstream lake, Type 5 or "Ns" stream or Category IV wetland as follows:
  - Design of flow splitting devices or drainage BMPs will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 or Ns stream reaches or lakes will approximate, but in no case exceed, durations ranging from 50 ~~percent~~% of the 2-year to the 50-year peak flow;
  - Flow splitting devices or drainage BMPs that deliver flow to Category IV wetlands shall be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction;
- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, and outfall protection) and extends to the ordinary high water mark of the exempt receiving water;
- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted in the bullet above.

Requirements for flow control

All runoff from hard surfaces and converted vegetation areas shall be infiltrated if feasible as determined in Volume III Chapter ~~III~~ 3 of this manual.

If infiltration is infeasible, stormwater flow control facilities shall be designed and constructed in accordance with Volume III ~~Chapter 3~~ of this manual so that stormwater discharges match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50 ~~percent~~% of the two-year peak flow up to the full 50-year peak flow. The pre-developed condition shall be matched to the fully-forested condition (soils and vegetation) ~~to which the Western Washington Hydrologic Model (WWHM) is calibrated,~~ unless:

- R~~r~~easonable, historic information is provided that indicates the site was prairie prior to Euro-American settlement; or
- The drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area since 1985, as shown in the map in Appendix I-G of this volume. In this case, the pre-developed condition to be matched shall be the existing land cover condition. Where basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the pre-developed condition assumption shall be the "historic" land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an approved basin study.

For project sites with multiple discharge points, a threshold discharge area analysis shall be required to determine whether multiple flow control and treatment facilities are required to provide flow control.

When a site has a closed depression that will be altered or modified, applicants shall perform a closed depression analysis and design flow control facilities in accordance with Volume III, Chapter 2.4 of this manual.

~~The volume of stormwater ponded in a parking lot may be considered as part of the required storage volume for flow control if all of the following requirements are met:~~

- ~~ponding is limited to a 0.5 foot elevation at the curb line;~~
- ~~no ponding is allowed in the emergency or drive lanes during a 100-year storm event;~~
- ~~discharges from the project site must meet the flow control standard applicable to the project in accordance with Volume III, Chapter 3 of this manual; and~~
- ~~the proposal complies with all other applicable code requirements and regulations.~~

2.5.8 Minimum Requirement 8: Wetlands Protection

~~See Volume I, Appendix I-D of this manual. If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both Minimum Requirement #8 and Minimum Requirement 7 apply.~~Projects shall employ Stormwater Management BMPs in accordance with the following thresholds, standards, and requirements to reduce the impacts of stormwater runoff to wetlands.

The objective of this Minimum Requirement is to ensure that wetlands receive the same level of protection as any other water of the state. Wetlands are extremely important natural resources that provide multiple functions and values, including ground water recharge, flood control, and stream channel erosion protection. They are easily impacted by development unless careful planning and management are conducted. Wetlands can be severely degraded by stormwater discharges from urban development due to pollutants in the runoff and also due to disruption of the natural hydrologic pattern of the wetland.

Appendix I-D: Wetland Protection Requirements shall be used for discharges to natural wetlands and mitigated wetlands.

Threshold Discharge Area Requirements

Minimum Requirement 8 applies only to threshold discharge areas whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system.

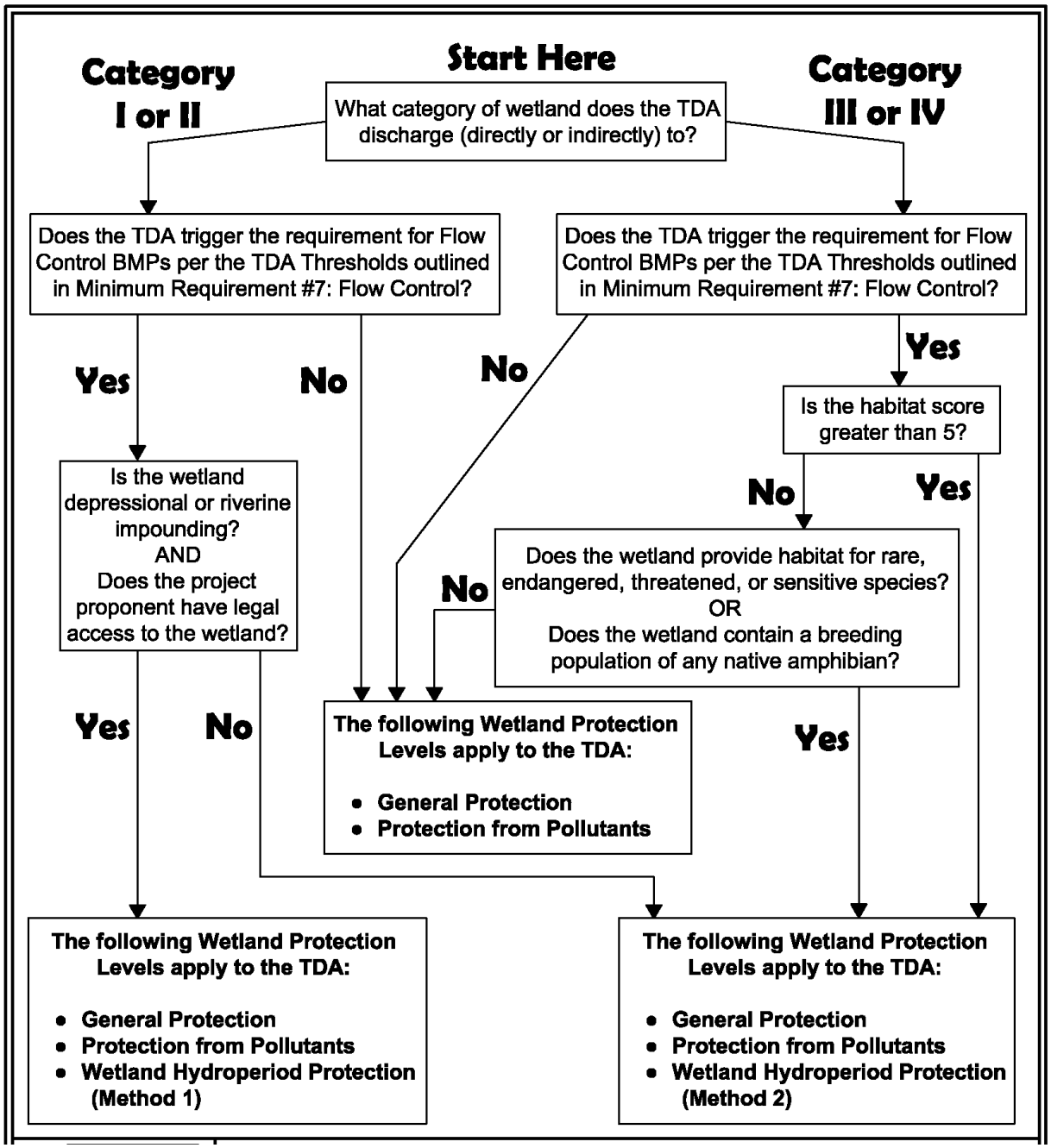
Each threshold discharge area within a project that requires Minimum Requirement 8 must be reviewed to determine what Level(s) of Wetland Protection must be applied to the threshold discharge area to comply with Minimum Requirement 8 (see Figure 1.4). The following information is needed to assess the impacts and risks to wetlands, and to determine the necessary protection level:

1. Size, boundary, and characteristics of the proposed project site, wetland contributing drainage area, and the wetland and its buffer;~~.~~

2. Following Ecology's Wetland Rating System for Western Washington: 2014 Update, determine:
    a. Wetland type;~~,~~
    b. Wetland category;~~,~~
    c. Wetland habitat score;~~,~~
3. Presence of rare, endangered, threatened, or sensitive species;~~,~~
4. Presence of breeding populations of native amphibian species;~~,~~
5. Use of an approved continuous runoff hydrologic model; and~~,~~
6. If Flow Control is required per Minimum Requirement 7, the project proponent may also need:
    a. Legal access to the wetland~~,~~
    b. Wetland field monitoring data (See Appendix I-D)

~~Refer to Figure 1.4 to determine what Level(s) of Wetland Protection must be applied to comply with Minimum Requirement 8.~~

Figure 1.4 – Levels of Wetland Protection



~~***CREATE FIGURE 1.4***~~

Levels of Wetland Protection

The following Levels of Wetland Protection are further explained in Appendix I-D: Wetland Protection Requirements.

General Protection

General Protection includes general practices that benefit wetlands of all types.

Protection from Pollutants

Protection from Pollutants includes measures to protect the wetland from pollutants in stormwater runoff. Measures of protection include Construction Stormwater BMPs, Source Control BMPs, LID practices and principles, and Runoff Treatment BMPs.

Wetland Hydroperiod Protection

Wetland Hydroperiod Protection includes measures to avoid excessive hydrologic alteration of existing wetlands from development. There are two methods within Wetland Hydroperiod Protection:

- Method 1: Monitoring and Wetland Stage Modeling

  This method requires data collection specific to the wetland, as well as continuous simulation modeling to demonstrate that the proposed project will not negatively alter the wetland hydrology.

- Method 2: Site Discharge Modeling

  This method requires continuous simulation modeling of the runoff from the TDA to demonstrate that the changes in total discharge volume to the wetland will remain similar to the pre-development condition.

Additional Requirements

Stormwater Management BMPs shall not be built within a wetland or its buffer, except for:

- Necessary conveyance systems as approved by Snohomish County; or
- As allowed in Appendix I-D, Section I – Compensatory Mitigation of Wetlands.

Reconciling the Flow Control Performance Standard from MR7 with MR8~~?~~

In most cases, if wetland hydroperiod protection is required per Minimum Requirement 8 then the flow control performance standard is also required per Minimum Requirement 7. In these cases, the designer must attempt to meet the requirements for both Minimum Requirements. This may prove to be feasible in many situations because Minimum Requirement 7 will seek to adjust the flow in small time intervals and Minimum Requirement 8 looks to maintain daily flow volumes.

If the designer is unable to meet both requirements, then the requirement to maintain the hydroperiod of the wetland becomes the overriding concern and the designer must show compliance with Minimum Requirement 8. If this is the case, the designer must also provide documentation detailing why they are unable to meet both requirements.

~~**Revising MR8 through a Basin Plan**~~

~~Basin Plans (see Appendix I-B: Basin Plans) can be used to develop alternative protection standards for wetlands and other sensitive areas, such as landslide hazard areas, wellhead protection areas, and ground water quality management areas. These standards can include Source Control, Runoff Treatment, Flow Control, stage levels, and frequency and duration of inundations.~~

2.5.9 Minimum Requirement 9: Operation and Maintenance

SCC 30.63A.575 through SCC 30.63A.605 contain requirements for inspection, operation and maintenance of stormwater facilities and BMPs. Maintenance ~~standards and additional specific~~ requirements are contained in Volume V, Chapter 4 and maintenance standards are contained in Volume VI of this manual. In addition to the requirements in Chapter 30.63A SCC, Chapter 7.54 SCC requires owners and operators of drainage facilities to inspect and maintain them in accordance with the requirements and standards set forth in Volumes V and VI.

Chapter 3 - Preparation of Stormwater Site Plans

When Mminimum Rrequirement 1 applies to a project pursuant to Part 300 of Chapter 30.63A SCC, the applicant shall prepare a stormwater site plan consistent with the requirements described below. A stormwater site plan is a comprehensive report containing all of the technical information and analysis necessary for the evaluation of a proposed new development or redevelopment project for compliance with the requirements of Chapter 30.63A SCC.

Prior to any land disturbing activity, the applicant shall submit the completed stormwater site plan. Chapters 2 and 4 of this volume shall be used to determine the Mminimum Rrequirements applicable to the project. Volumes II through V of this manual shall be used during the selection of BMPs. A Stormwater Pollution Prevention Plan (SWPPP) developed in accordance with the requirements of Volume II, Chapter 3 shall be included in the Stormwater Site Plan.

The following types of stormwater site planning work shall be performed by or under the direction of a professional engineer licensed in Washington sState:

- Stormwater site plans that involve engineering calculations;
- Design of stormwater treatment or flow control facilities;
- Design of structural source control BMPs;
- Design of drainage conveyance systems; and
- Design of stormwater facilities using low impact development (LID) best management practices (BMPs).

Chapters 3.1 through 3.7 describe the steps used to develop the stormwater site plan. The level of detail needed for each step may depend upon the nature and size of the project as explained in the description of the individual steps.

Interspersed throughout this chapter are principles derived from the first three design guidelines from BMP T5.41: Better Site Design from Volume V of this manual. Theose design guidelines are to be used to define the development envelope and protected area; to minimize directly connected impervious areas; and to maximize permeability. BMP T5.41 includes two other design guidelines that, while not incorporated into this chapter, are highly encouraged to be considered by the site designer. Those guidelines are: (1) maximize choices for mobility by designing developments to promote alternatives to automobile use; and (2) use drainage as a design element by applying stormwater management techniques early in site plan development.

3.1 Site Analysis

The applicant will gather and analyze information about the site as described below. This information and analysis will serve as the basis for determining site-related constraints on the project and appropriate BMPs for the project. Further, the site analysis will determine how to integrate low impact site design into the planning and design process where feasible.

The site analysis shall include at a minimum, the following information for projects required to meet Minimum Requirements 1-5.

Boundary survey

A boundary survey of the site prepared by a registered land surveyor that shows the following:

- Tthe location and square footage of existing public or private development, hard surfaces, and setbacks to the boundary lines for any new or existing buildings or structures;
- Eelevations of the building site and structure at a contour interval consistent with the design requirements of the site;
- Tthe setbacks to the property lines for any proposed grading activity, the setbacks from a property line or structure to any proposed drainage facility, the separations to any well, wellhead protection area, on-site sewerage system or other utility, or separations to any critical area other than aquifer recharge areas, or frequently flooded areas; and
- Tthe location of any easements of record that encumber the property and that would affect site development.

The boundary survey requirement may be waived for certain projects at the discretion of the cCounty.

Topographic map

A topographic map that locates all major or minor hydrologic features such as rivers, streams, wetlands and their buffers based on their critical area classification, drainage courses, ditches (public or private), closed depressions or natural stormwater storage areas, seeps or springs. The map shall show the contour intervals for the site consistent with Volume I, Chapter 3 of this manual.

Utility infrastructure map

Provide the county with a map of all utility infrastructure existing or proposed within 200 feet of the subject site. The utilities shown shall reflect either the record drawing, providing copies of these at site plan submittal or field surveyed location of the utilities, water, sewer, storm drainage, power, cable, gas, telephone and any other franchised utility or private utility, well, or on-site sewerage system and referenced to the property boundaries or right of way centerline.

Vegetation map

Provide a map of the existing vegetation, trees to be retained and areas where native growth and native soils shall be retained on-site in an undisturbed fashion. A landscape architect, arborist, qualified biologist or applicant shall identify any forest areas on site and prepare a plan to protect those areas. The preserved forested areas shall be protected within all new development and redevelopment areas where feasible as a native growth protection area (NGPA) or if part of a critical area within a critical area protection area (CAPA). These areas shall be shown on the site plan protected in a separate tract. If the trees are to be retained and protected on an individual lot, it shall be done via a recorded easement or covenant.

Soils report

The applicant shall prepare a soils report prepared by a licensed professional engineer, geologist, hydrogeologist, engineering geologist or on-site sewerage designer, registered in the sState of

Washington. The report shall contain the following information:

- Identification and characterization of soils on-site using soil surveys, soil test pits, borings or by soils tests;
- Map showing the location of each soil test pit or boring, with detailed soils logs and soils descriptions, depth to the seasonal high water table or impermeable layer, mottling and presence of soils stratification, if any;
- Grain size distribution;
- Cation exchange capacity;
- Percent of clay content; and
- Initial saturated hydraulic conductivity ($K_{sat,\ initial}$).

Test requirements for soil analyses and $K_{sat,\ initial}$ are found in Volume III, Chapter 3 of this manual: Chapters 3.3.5 and 3.3.6 contain test requirements for infiltration systems intended to meet Minimum Requirement 7, and Chapter 3.3.10 contains test requirements for permeable pavement and bioretention systems that are intended to meet Minimum Requirement 5.

NOTE: Tthe information from the tests above is required to determine feasibility of bioretention and permeable pavement. If either of these BMPs must be considered for the project in accordance with Minimum Requirement 5, the soil testing described above must be performed at the following locations and spatial frequency, unless the licensed professional determines that soil or groundwater conditions are sufficiently uniform on the site to allow omitting some tests without compromising proper function of BMPs at locations not tested:

- Projects to which only Minimum Requirements 1-5 apply: Perform one set of tests.
- Multi-lot residential developments: Perform one set of tests on each proposed lot.
- Commercial developments: Perform one set of tests per every 5,000 square feet of project site.
- Linear projects (e.g., roadways): Perform one set of tests per every 200 lineal feet of project, and within each section of the project having significant differences in subsurface characteristics.

The ~~County~~county may require the testing for seasonal high groundwater table or saturated hydraulic conductivity test to be performed during the wet season.

The applicant may use prior property land survey maps, topographic survey data, prior engineering designs for stormwater, soils reports, geotechnical or geologic reports prepared covering the site, utility maps obtained from the utility companies covering the site and other available data obtained through research to assist in the site analysis to integrate low impact design into the stormwater site plan where feasible, to meet Minimum Requirements 1-5.

Site analysis and summary of existing conditions

The applicant shall collect, analyze and document information on the existing site conditions, including topography, drainage patterns, soils, depth to groundwater or impermeable layer, ground cover, presence of any critical areas, adjacent areas, existing development, existing

stormwater facilities, and adjacent on- and off-site utility facilities. Data shall be analyzed to determine site limitations including:

- Aareas with high potential for erosion and sediment deposition (based upon soil properties, slope, etc.);
- Llocations of critical areas;
- Llocations of tree retention, tree replacement, and landscaping required pursuant to Title 30 SCC, if applicable;
- Rrequired or existing open space areas, tracts or easements; and
- Llocations where on-site stormwater management BMPS are feasible for the particular type of new development or redevelopment being proposed.

Areas of site limitation shall be delineated on the stormwater site plan. Critical areas shall be shown on a critical area site plan pursuant to chapter 30.62A SCC which shall be recorded with the Snohomish County Auditor.

3.2 Preliminary Development Layout

Based upon the site analysis described in Chapter 3.1, the applicant shall prepare a preliminary development layout that locates the proposed buildings, roads, parking lots, landscaping areas, on-site stormwater management BMPs, and buffers for the proposed development. The following design principles shall be used:

- Ffit development to the terrain to minimize land disturbance and the amount of grading activity where feasible;
- Cconfine construction activities to the smallest area possible, and away from critical areas;
- Ppreserve natural vegetation (especially forested areas) as much as possible;
- Oon sites with a mix of soil types, locate impervious areas over less permeable soil (e.g., till), and limit development over more porous soils (e.g., outwash);
- Ccluster buildings together;
- Mminimize impervious surface areas; and
- Mmaintain and utilize natural drainage patterns.

The preliminary development layout shall be used to identify threshold discharge areas. For each threshold discharge area, the applicant shall determine the applicable stormwater treatment and flow control BMPs, in accordance with Minimum Requirements 6, 7 and 8. The preliminary development layout shall be used to prepare the drawings and maps required for the stormwater site plan.

3.3 Off-site (Upstream and Downstream) Analysis

The applicant shall prepare a general off-site analysis report comprising a downstream analysis and an upstream analysis. The off-site analysis shall assess existing and potential problems related to off-site water quality, stream channel erosion, slope stability, conveyance system capacity, and drainage impacts associated with the new development or redevelopment project.

The analyses shall be qualitative unless the ~~County~~county determines that a quantitative analysis is needed, or if a quantitative analysis is required as described below.

The applicant shall physically inspect the existing onsite and offsite drainage systems of the study area for each discharge location for existing or potential problems and drainage features. An initial inspection and investigation should include the following actions:

- Investigate problems reported or observed during the resource review;
- Locate existing or potential constrictions or capacity deficiencies in the drainage system;
- Identify existing or potential flooding problems;
- Identify existing or potential overtopping, scouring, bank sloughing, or sedimentation;
- Identify significant destruction of aquatic habitat (e.g., siltation or stream incision);
- Collect qualitative data on features such as land use, impervious surface, topography, soils, presence of streams, and wetlands;
- Collect information on pipe sizes, channel characteristics, and drainage structures;
- Verify tributary drainage areas;
- Contact local governments, neighboring property owners, and residents about drainage problems; and
- Note date and weather at time of inspection.

The off-site analysis report shall contain a map of the study area showing study area boundaries, property lines and site boundaries; topography (at a minimum equivalent to USGS 1:24000 Quadrangle map), downstream flowpath, and potential/existing problems. Records to be reviewed in the preparation of the off-site analysis include available basin plans, ground water management area plans, drainage studies, FEMA flood insurance rate maps, wetlands inventory maps, critical areas maps, stream habitat reports, and salmon distribution reports available from Washington s~~S~~tate.

The report shall contain the location, physical description, problems, and field observations of each drainage system component, and shall describe existing or potential problems (e.g., ponding water, erosion) as follows:

- Magnitude of or damage caused by the problem;
- General frequency and duration;
- Return frequency of storm or flow when the problem occurs (may require quantitative analysis);
- Current mitigation of the problem; and
- Whether the project is likely to aggravate the problem or create a new one.

Upon review of this analysis, the director may require mitigation measures deemed adequate for the problems, or a quantitative analysis, depending upon the presence of existing or predicted flooding, erosion, or water quality problems, and on the proposed drainage facilities for the project.

The quantitative analysis should provide information on the severity and frequency of an existing problem or the likelihood of creating a new problem. It should evaluate proposed mitigation intended to avoid aggravation of the existing problem and to avoid creation of a new problem.

Downstream analysis

The downstream analysis shall assess the area downstream of the subject property for the entire flow path from the project site to the nearest surface receiving water or up to one quarter mile, whichever is less.

The downstream analysis shall:

- Eevaluate potential downstream drainage impacts as well as the adequacy of the downstream drainage facilities to accommodate flows from the development activity and all other upstream sources identified in the contributing threshold discharge area or areas;
- Pprovide a narrative of the downstream conditions and a computation of the adequacy of downstream conveyance systems required under SCC 30.63A.730;
- Iinclude a summary of a visual inspection of the condition of the downstream drainage system, whenever possible, and photographic documentation to verify that it will function in accordance with the downstream analysis; and
- Pprovide documentation of drainage problems identified in the Snohomish County Drainage Needs Report (DNR) or equivalent studies, and in the Snohomish County Department of Public Works Surface Water Management drainage complaint database.

If the downstream analysis indicates that flooding of a building, structure, road, critical area, lake or fishery resource has the potential to occur within the area of analysis, the Countycounty may require further evaluation of the potential impacts of the new development activity to the downstream area beyond the area initially analyzed.

Upstream analysis

The upstream analysis shall assess the area upstream from the project site, which drains onto or through the site. The analysis shall:

- eEvaluate potential drainage impacts that may occur upstream as a result of the project;, and
- cCalculate the area of land and drainage flow to the site.

Mitigation Report

If the downstream analysis or the upstream analysis finds that the proposed new development or redevelopment project may cause off-site drainage impacts, the applicant shall submit a mitigation report that proposes mitigation of those impacts.

For the purposes of this site analysis, off-site drainage impacts are defined as the circumstances under whichfollowing:

- Uwhen upstream runoff from peak flow in a 100-year storm event would cause impacts upstream including flooding of a building, structure, road, critical area, lake or fishery resource; or
- Dwhen downstream runoff causes a 0.10.15 cubic feet per second or greater increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other model approved by the Washington State Department of Ecology and Snohomish Countyan approved continuous runoff hydrologic model, or causes flooding of a building, structure, road, critical area, lake or fishery resource.

Mitigation measured shall be selected using the following sequence: avoid impacts, minimize impacts, rectify impacts, compensate for impacts. If the selection of any single mitigation preference isbe determined inadequate by the Countycounty, a combination of two or more mitigation approaches shall be required.

As noted above, the ~~County~~county may require the applicant to perform a quantitative analysis when the qualitative analysis required by this chapter finds that the proposed new development or redevelopment project may cause significant adverse impacts. When a quantitative analysis is required, it shall be used in developing the mitigation required by this chapter.

When a new development project or a redevelopment project will be developed in phases, a mitigation plan shall be identified for each project phase, based on the drainage impacts associated with each phase.

In addition to the requirements above, and in accordance with M~~m~~inimum R~~r~~equirement 6, an off-site treatment analysis from the project site to the nearest surface receiving water or up to one quarter mile, whichever is less, and a mitigation report shall be required for projects that:

- A~~a~~dd 5,000 square feet or more of new hard surface;
- C~~c~~onvert three-quarters of an acre of pervious surfaces to lawn or landscaped areas; or
- C~~c~~onvert 2.5 acres of forested area to pasture.

3.4 Determination of Applicable Minimum Requirements

The applicant shall determine the applicable M~~m~~inimum R~~r~~equirements for new development and redevelopment pursuant to the requirements set forth in SCC 30.63A.300 and 30.63A.310, and in accordance with the information in Chapter 2 of this volume.

3.5 Preparation of Permanent Stormwater Control Plan

The applicant shall prepare a permanent stormwater control plan. Stormwater control BMPs and facilities that will serve the project site in its developed condition shall be selected using the process outlined in Chapter 4 of this volume. In preparing a stormwater site plan, the applicant shall consider how to reduce or minimize the need for constructed stormwater facilities by minimizing proposed impervious surfaces and minimizing land disturbing activities, grading and creation of hard surfaces when feasible and preserving overstory vegetation and tree canopies where feasible. The final BMPs and facilities which are selected by the applicant shall be depicted on the permanent stormwater control plan.

The permanent stormwater plan shall include the following:

- I~~i~~f flow control facilities are required to comply with Minimum Requirement 7 or Minimum Requirement 8, a description of the existing site hydrology, including a list of assumptions and site parameters used in analyzing the predeveloped site hydrology~~.~~; This description shall be submitted with the plan and shall be reflected in the stormwater calculations;
- T~~t~~he acreage, soil types, and land cover used to determine the pre-developed flow characteristics, along with basin maps, for each subbasin affected by the project. The pre-developed condition shall be a forested land cover unless historic information is provided that indicates the site was prairie prior to settlement; and
- A~~a~~ topographic map to determine basin boundaries that shows the following:
  - D~~d~~elineation and acreage of upstream areas contributing runoff to the site;
  - F~~f~~low control facility locations;

- Ooutfall locations;
- Ooverflow route;
- Aall natural streams and drainage features, including the direction of flow, acreage of areas contributing drainage, and the limits of land disturbing activity; and
- Eeach basin within or flowing through the site and model input parameters for each basin.

All stormwater site plan narratives shall describe the site hydrology and include a table showing the totals of hard surfaces, pollution-generating hard surfaces, and pollution-generating pervious surfaces for each threshold discharge area for which on-site stormwater management BMPs are the sole stormwater management approach. The calculations will be used to verify that the thresholds for application of treatment, flow control facilities and wetland protection pursuant to Minimum Requirements 6, 7 and 8 are not exceeded. The site plan narrative shall also describe any proposed credits that will be proposed for any permeable surfaces and/or tree retention within the flow control analysis as part of Minimum Requirement 7 consistent with the guidelines established in Volume III, Chapter 2 of this manual.

The permanent stormwater control plan for development activities requiring treatment and flow control facilities pursuant to Minimum Requirements 6, 7 and 8 shall include the following information:

- A narrative and , mathematical and graphic presentations of model input parameters selected for the developed site conditions, including acreage, soil types, land covers, tree coverage, road layout, and all drainage facilities and easements;
- Ddeveloped basin areas, threshold discharge areas, and flow which are cross-referenced to computer printouts or calculation sheets. Developed basin flows shall be listed and tabulated in the documentation;
- Aany documents used to determine the developed site hydrology. The same basin identification used for the pre-developed site hydrology shall be used whenever possible. If the boundaries of a basin are modified by the project proposal, they shall be clearly shown on a map and the basin identification shall be modified to indicate the change;
- Ffinished grade topographic maps;
- Ggrading documentation to demonstrate that the design incorporated the minimum grading necessary for the new development or redevelopment activity;
- Ffinished floor elevations, when required by the director, if they are needed to address topographical or existing infrastructure constraints;
- Iif treatment facilities are required or proposed, a listing of the water quality menus used according to Volume V, Chapter 3 of this manual shall be provided to describe the permanent stormwater control plan performance standards and goals. If flow control facilities are proposed, confirmation shall be provided that the flow control standard is achieved using the flow duration standards in Volume III of this manual;
- Ddocumentation regarding flow control systems, including:

- Ddrawings of flow control facilities and their appurtenances showing basic measurements necessary to calculate the storage volumes available in live and dead storage, all orifice/restrictor sizes and head relationships, control structure/restrictor placement, and placement on the site; and
- Aa hydrologic analysis including computer printouts, calculations, equations, references, storage/volume tables, graphs as necessary to show results and the methodology used to determine the storage facility volumes. Where the Western Washington Hydrology Model (WWHM) or other runoff model approved by the Washington State Department of Ecology an approved continuous runoff hydrologic model is used, its documentation files shall be included;

- Ddocumentation regarding stormwater treatment systems, including:
  - Aa drawing of the proposed treatment facilities and any structural source control BMPs. The drawing must show overall measurements and dimensions, placement on the site and location of inflow, bypass, and discharge systems; and
  - Hhydrologic model output documents and all related calculations, equations, references, and graphs necessary to show that the facilities are designed consistent with the requirements and design criteria of Volume V of this manual;
- Ddocumentation regarding permanent stormwater control plan conveyance systems including:
  - An analysis of any existing conveyance systems and the analysis and design of the proposed stormwater conveyance system for the project. This information shall be presented in a clear, concise manner that can be easily followed, checked, and verified; and
  - Clear labeling of all pipes, culverts, catch basins, channels, swales, and other stormwater conveyance appurtenances that correspond directly to engineered stormwater control plans; and
- Aa description of all proposed on-site stormwater management BMPs for the new development or redevelopment activity.

3.6 Preparation of Stormwater Pollution Prevention Plan (SWPPP)

The applicant shall prepare a SWPPP that meets the requirements of Volume II, Chapter 3.

3.7 Completion of Stormwater Site Plan.

Using the information described above in this chapter, the applicant shall prepare a stormwater site plan that includes the following documents and information:

- A project overview narrative that provides a general description of the project, pre-developed and developed conditions of the site, site area and size of the improvements, and the pre- and post-developed stormwater runoff conditions. The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows;

- A vicinity map that clearly locates the property, identifies all roads bordering the site, shows the route of stormwater off-site to the natural receiving waters, and shows significant geographic features and critical areas (e.g., streams, wetlands, lakes, slopes greater than 33 ~~percent~~% where seeps are present as well as a geologic contact~~, etc.~~);
- Stormwater site planning sheets which display the:
  - Acreage and boundaries of all drainage basins;
  - Existing stormwater drainage to and from the site to the stream or one quarter mile off-site, whichever is nearer to the site;
  - Routes of existing drainage courses, construction pipes, ditches and future flows at all discharge points;
  - Length of travel from the farthest upstream end of a proposed storm drainage system to any proposed flow control and treatment facility;
  - ~~o~~
  - P~~p~~roposed flow control and treatment facility;
  - Significant geographical features;
  - Critical areas; and
  - Soils within the project site;
- Existing conditions summary;
- Any areas of site limitation;
- Off-site analysis (upstream and downstream) and mitigation report;
- Drainage design, including the basis on which feasibility or infeasibility of on-site stormwater management BMP's was determined;
- SWPPP prepared pursuant to Volume II Chapter 3;
- Permanent stormwater control plan;
- Special reports, studies and maps conducted to prepare the stormwater site plan (e.g., soil testing, critical areas reports and delineations);
- A list of other necessary permits and approvals as required by other regulatory agencies if those permits or approvals include conditions that affect the stormwater site plan or contain more restrictive drainage-related requirements;
- An operation and maintenance manual for each flow control and treatment facility. The manual should contain a description of the facility. The manual must identify and describe the maintenance tasks and the frequency of each task meeting the standards established in Volume V, Chapter 4~~.~~. A maintenance activity log shall be provided that indicates what maintenance actions will be taken, by whom and when, pursuant to Chapter 7.54 SCC; and
- Documentation to establish the appropriate security device amount when required under Chapter 30.84 SCC.

Chapter 4 - BMP and Facility Selection Process for Permanent Stormwater Control Plans

4.1 Purpose

This chapter describes how to select stormwater control BMPs and facilities that will serve the project site in its developed condition.

4.2 BMP and Facility Selection Process

Step 1: Determine and Read the Applicable Minimum Requirements set forth in Snohomish County code.

SCC 30.63A.300 through SCC 30.63A.310 set forth the Minimum Requirements applicable to various kinds of projects.

Step 2: Select Source Control BMPs

Note: ~~:~~ S~~s~~kip this step for single-family residential development projects.

Refer to Volume IV of this manual. If the project involves construction of areas or facilities to conduct any of the activities described in Volume IV, Chapter 5, the applicable structural source control BMPs described in that section must be constructed as part of the project.

The project may have additional source control responsibilities as a result of area-specific pollution control plans (e.g., watershed or basin plans, water clean-up plans, groundwater management plans, ~~and~~ lakes management plans).

Step 3: Identify Discharge Areas and Applicable Requirements for Treatment, Flow Control, and Wetlands Protection

Using the following procedures, identify the threshold discharge areas on the project site, and, for each threshold discharge area, the applicable requirements for stormwater treatment, flow control, and wetlands protection. These determinations shall be made using the definitions of the following terms found in the Glossary of this volume: effective impervious surface, impervious surface, hard surface, pollution-generating impervious surface (PGIS), pollution-generating hard surface, pollution-generating pervious surface (PGPS), converted vegetation areas, and threshold discharge area.

Step 3a: Identify threshold discharge areas and their characteristics

Identify the threshold discharge areas for the project site, and for each threshold discharge area, determine the following characteristics:

- Total area in square feet (s.f.);
- A~~a~~rea (s.f.) of pollution-generating hard surfaces (including pollution-generating permeable pavements);
- A~~a~~rea (s.f.) of pollution-generating pervious surfaces (not including permeable pavements);
- A~~a~~rea (s.f.) of effective impervious surface;

- Aarea (s.f.) of converted vegetation areas in each threshold discharge area; and
- Wwhether the water discharged from the threshold discharge area drains to a wetland.

Step 3b: Determine whether stormwater treatment is required

For each threshold discharge area, stormwater treatment is required if either of the following is true:

- Tthe amount of pollution-generating hard surfaces is 5,000 square feet or more; or
- Tthe total of pollution-generating pervious surfaces (PGPS) in the threshold discharge area, excluding permeable pavement, and from which stormwater will be discharged in a natural or man-made conveyance system from the site, is three-quarters (3/4) of an acre or more.

If stormwater treatment is required, use the procedures in Step 5 to select an appropriate stormwater treatment facility. Note that stormwater from multiple threshold discharge areas can be treated in a single stormwater facility designed ~~on the basis of~~based on the combined flows.

Step 3c: Determine whether flow control is needed per area-based criteria

Unless excepted as stated below, for each threshold discharge area, stormwater flow control is required if any one of the following criteria is true:

- Tthe total of effective impervious surfaces is 10,000 square feet or more;
- Tthree-quarters of an acre (32,670 s.f.) or more of native vegetation is converted to lawn or landscape and surface water is discharged from the site into a conveyance system or receiving waters; or
- 2.5 acres (108,900 s.f.) or more of native vegetation are converted to pasture and surface water is discharged from the site into a conveyance system or receiving waters.

If stormwater flow control is required, use the procedures in Step 4 to select an appropriate stormwater flow control facility. If the water discharged from the threshold discharge area drains to a wetland, the flow control facility must meet the wetland protection requirements set forth in Appendix I-D of this volume.

Exception for flow control requirement:

Flow control is not required for projects that discharge directly or indirectly through a municipal separate storm sewer system to a water listed in Volume I, Appendix I-E of this manual subject to the following restrictions:

- Any direct discharge shall not result in the diversion of drainage from any lake, wetland or stream classified as Type 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Type "S", "F", or "Np" in the Permanent Water Typing System, or from any Category I, II, or III wetland;
- Flow splitting devices or drainage BMPs shall be applied to route natural runoff volumes from the project site to any downstream lake, Type 5 or "Ns" stream or Category IV wetland as follows:
    - Design of flow splitting devices or drainage BMPs will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 or

Ns stream reaches or lakes will approximate, but in no case exceed, durations ranging from 50 percent of the 2-year to the 50-year peak flow;

- Flow splitting devices or drainage BMPs that deliver flow to Category IV wetlands shall be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction;

- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, and outfall protection) and extends to the ordinary high water mark of the exempt receiving water;
- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted in the bullet above.

Step 3d: Determine whether flow control is needed per flow-based criterion

Unless excepted as stated in Step 3c, for each threshold discharge area, stormwater flow control is required if a combination of hard surfaces and converted pervious surfaces cause a ~~0.1~~0.15 cubic feet per second (cfs) or greater increase in the 100-year flow frequency from a threshold discharge area as estimated using ~~the Western Washington Hydrology Model or other model approved by the Washington State Department of Ecology and Snohomish County~~an approved continuous runoff hydrologic model, and ~~one-hour~~15-minute time step~~s (or a 0.15 cfs increase or greater using 15-minute time steps)~~. The ~~0.10 cfs (one-hour time steps) or~~ 0.15 cfs ~~(15-minute time steps)~~ increase should be a comparison of the post-project runoff to the existing condition runoff. NOTE: For the purpose of applying the ~~0.10 cfs or~~ 0.15 cfs threshold~~s~~, the existing condition shall be the pre-project land cover, with the condition that Snohomish County may require the use of land cover documented for the site at an earlier date in accordance with the requirements of SCC 30.63A.845.

If stormwater flow control is required, use the procedures in Step 4 to select an appropriate stormwater flow control facility. If the water discharged from the threshold discharge area drains to a wetland, the flow control facility must meet the wetland protection requirements set forth in Appendix I-D of this volume.

Step 4: Select Flow Control Facility

For each threshold discharge area in which stormwater flow control is required per Step 3 above, select an appropriate flow control system using the following procedure. The requirements set forth in Volume III~~, Chapter 3~~ shall be used to size and design the selected facilities. If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both the facility shall meet the requirements of both Minimum Requirement #7 (flow control) and Minimum Requirement #8 (wetlands protection).

As noted in Section 2.5.5 of this volume, most of the on-site stormwater management or low impact development (LID) BMPs contained in this manual provide flow control modeling credit

towards compliance with Minimum Requirement 7 – Flow Control. Specific attention is called to BMPs T5.17 (Vegetated Roofs), T.5.18 (Reverse Slope Sidewalks), T5.19 (Minimal Excavation Foundations), and T5.20 (Rainwater Harvesting), which do not factor into compliance with Minimum Requirement 5 – On-site Stormwater Management, but which provide flow control modeling credit. Further, BMPs T5.17 (Vegetated Roofs) and T5.20 (Rainwater Harvesting) can be used on sites where infiltration is infeasible due to soil infiltration capacity or depth to groundwater. LID BMPs are required as directed by this Manual. In recognition of the fact that LID BMPs work to manage stormwater pollution and runoff, Snohomish County encourages their use beyond what is required by this Manual. Information on BMPs T5.17 – T5.20 is found in Volume V, Chapter 5 of this Manual.

Step 4a: Determine whether stormwater infiltration can be used.

There are two possible options for infiltration.

The first option is to infiltrate through rapidly draining soils that meet the site characterization and Site Suitability Criteria set forth in Volume III, Chapter 3 of this manual for providing flow control, but do not meet Site Suitability Criterion (SSC) 6 – Soil Physical and Chemical Suitability for treatment. If the site is suitable for flow control using infiltration but SSC 6 is not met, flow control can be accomplished using infiltration provided the requirements for treatment set forth in Step 5 below are met. The infiltration facility must provide adequate volume such that the flow duration standard of Minimum Requirement 7 will be achieved.

The second option is to infiltrate through soils that meet the site characterization and site suitability criteria in Volume III, Chapter 3. The facility would be designed to meet the requirements for treatment and flow control.

If infiltration facilities for flow control are planned, the flow control requirement has been met; proceed to Step 5. If infiltration facilities are not planned, proceed to Step 4b.

Step 4b**:** Use ~~the Western Washington Hydrology Model~~an approved continuous runoff hydrologic model to size a detention facility.

Refer to Volume III~~, Chapter 2, for an explanation of the use of the Western Washington Hydrology Model~~ for detention facility design. Note that reducing the level of site disturbance reduces the size of the required flow control facility.

Step 5: Select Stormwater Treatment Facilities

For each threshold discharge area in which stormwater treatment is required per Step 3 above, select an appropriate treatment system using the following procedure. The requirements set forth in Volume III ~~, Chapter 3~~ and Volume V shall be used to size and design the selected facilities.

Volume V, Chapter 12 of this manual includes information about stormwater treatment BMPs to which the Washington State Department of Ecology has given a use-level designation for pretreatment, oil, phosphorous, enhanced, or basic treatment. Snohomish County will approve the use of the subset of those BMPs to which Ecology has given a General Use-Level Designation (GULD).

NOTE: ~~-~~Only basic treatment is required for landscaped areas of industrial, commercial, and multi-family project sites, and parking lots of industrial and commercial project sites, dedicated

solely to parking of employees' private vehicles, which do not involve any other pollution-generating sources (e.g., industrial activities, customer parking, storage of erodible or leachable material, wastes or chemicals).

Step 5a**:** Determine the receiving waters and pollutants of concern based on offsite analysis.

Determine the natural receiving waters (e.g., ground water, wetland, lake, stream, salt water) for the stormwater drainage from the project site. If the discharge is to the Snohomish County storm drainage system, the receiving waters for the drainage system must be determined.

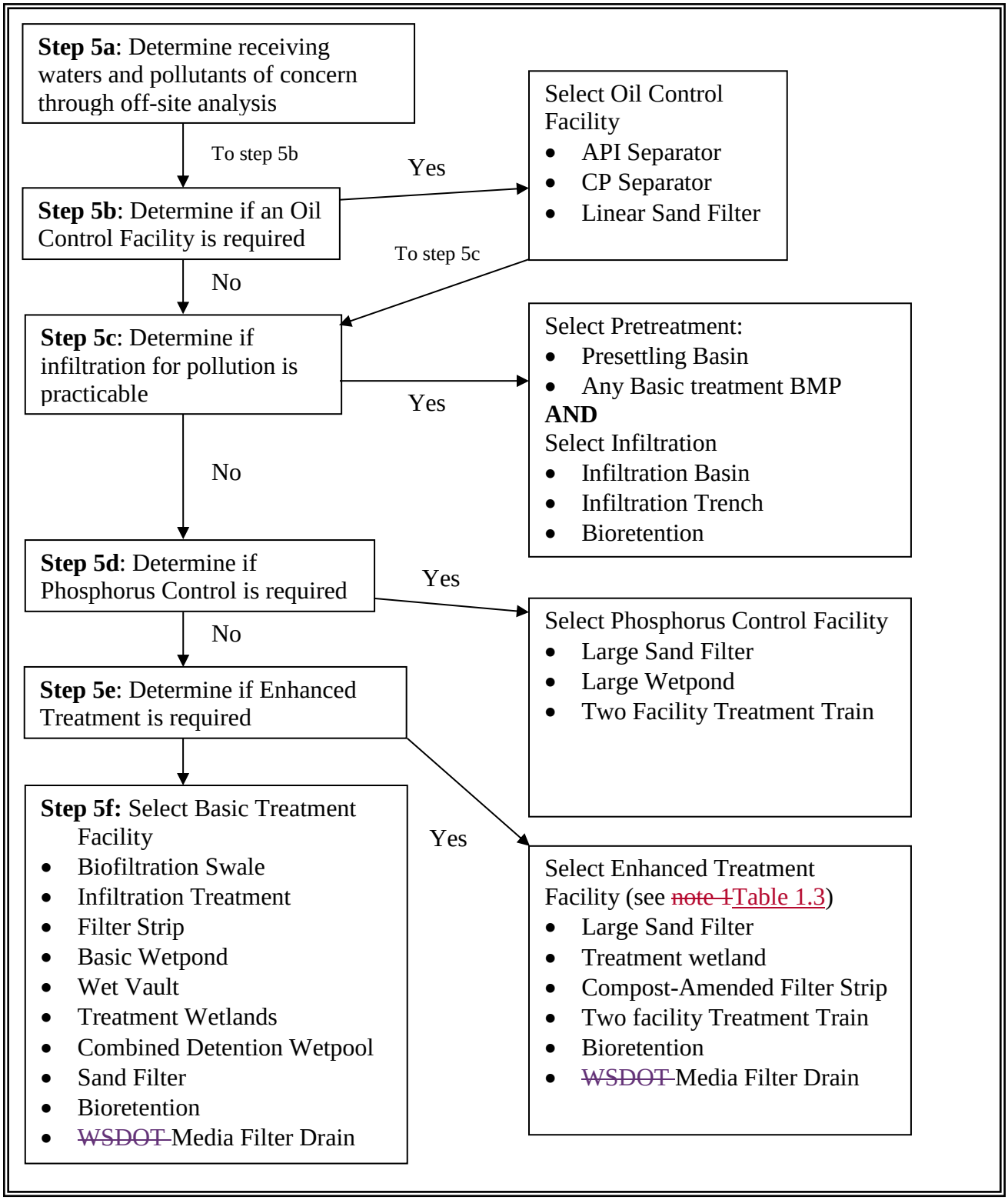
Step 5b: Determine if an oil control facility is required

Oil control facilities are required for projects that have "high-use sites." High-use sites are those that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. High-use sites include:

- An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area. Note: Snohomish County will consider fueling stations, with or without small convenience stores, to be a high-use site unless the applicant demonstrates, to the ~~County~~county's satisfaction and through the stormwater site planning process, that the ADT threshold will not be met.
- An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil.
- An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.).
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

The traffic count can be estimated using information from "Trip Generation," published by the Institute of Transportation Engineers, or from a traffic study prepared by a professional engineer or transportation specialist with experience in traffic estimation.

Figure 1.4 Treatment Facility Selection Flow Chart



Some land use ~~type~~s require the use of a spill control (SC-type) oil/water separator. S~~T~~hose ~~s~~situations in which such a separator is necessary are described in Volume IV and are separate from this treatment requirement. While a number of activities may ~~be~~ require~~d~~ t~~he~~o use of spill control (SC-type) separators, only a few will necessitate American Petroleum Institute (API) or coalescing plate (CP)-type separators for treatment. The following urban land uses are likely to have areas that fall within the definition of "high-use sites" or have sufficient quantities of free oil present that can be treated by an API or CP-type oil/water separator.

- Industrial m~~M~~achinery and e~~E~~quipment, and r~~R~~ailroad e~~E~~quipment m~~M~~aintenance;
- Log s~~S~~torage and s~~S~~orting y~~Y~~ards;
- Aircraft m~~M~~aintenance a~~A~~reas;
- Railroad y~~Y~~ards;
- Fueling s~~S~~tations;
- Vehicle m~~M~~aintenance and r~~R~~epair; and
- Construction b~~B~~usinesses (e.g., paving, heavy equipment storage and maintenance, storage of petroleum products).

Oil control facilities are to be placed upstream of other stormwater facilities and as close as is feasible to the oil source. For high-use sites located within a larger commercial center, only the impervious surface associated with the high-use portion of the site is subject to treatment requirements. If common parking for multiple businesses is provided, treatment shall be applied to the number of parking stalls required for the high-use business only. However, if the treatment collection area also receives runoff from other areas, the treatment facility must be sized to treat all water passing through it.

High-use roadway intersections shall treat lanes where vehicles accumulate during the signal cycle, including left and right turn lanes and through lanes, from the beginning of the left turn pocket. If no left turn pocket exists, the treatable area shall begin at a distance equal to three car lengths from the stop line. If runoff from the intersection drains to more than two collection areas that do not combine within the intersection, treatment may be limited to any two of the collection areas.

If an oil control facility is required, select one of the options below.

- API-Type Oil/Water Separator – See Volume V, Chapter 11
- Coalescing Plate (CP) Oil/Water Separator – See Volume V, Chapter 11
- Linear Sand Filter – See Volume V, Chapter 8
- Any BMP for which Ecology has issued a General Use Level Designation for oil control

The linear sand filter is used in the basic, enhanced, and phosphorus treatment menus also. If used to satisfy one of those treatment requirements, the same facility shall not also be used to satisfy the oil control requirement unless quarterly maintenance is assured.

Step 5c: Determine whether infiltration for pollutant removal is practicable

If the evaluation in Step 4a determines the site is unsuitable to provide flow control using infiltration, the site is also unsuitable for stormwater treatment using infiltration. If so, proceed to Step 5d.

If the site is suitable for flow control using infiltration, determine whether native soils are suitable for treating stormwater by infiltration in accordance with Site Suitability Criterion SSC-6 in Volume III, Chapter 3.3.7. Infiltration treatment facilities must be preceded by a pretreatment facility (see Volume V, Chapter 6), which may be a presettling basin, an oil control facility, or a basic treatment facility. If an oil/water separator is used for pretreatment, more frequent facility inspections may be necessary to determine when accumulated solids exceed the sediment depth at which maintenance is required (See Volume VI~~, Chapter 4~~).

If infiltration treatment is practicable, select an infiltration facility and an appropriate pretreatment facility.

If infiltration treatment is not practicable, proceed to Step 5d.

Step 5d: Determine if a phosphorus control facility is required.

Control of phosphorus in new development or redevelopment is required prior to:

- S~~s~~urface discharge to waters reported under section 305(b) of the Clean Water Act and designated as not supporting beneficial uses due to phosphorus;
- S~~s~~urface discharge to water bodies those waters listed in Washington s~~S~~tate's Nonpoint Source Assessment required under section 319(a) of the Clean Water Act because of nutrient concentrations;
- S~~s~~urface discharge to wetlands categorized as Category I or Category II by the Washington State Wetland Rating System of Western Washington; or
- S~~s~~tormwater infiltrated within one-quarter mile of a phosphorus-sensitive receiving water or a tributary to that water in soils that do not meet the soil suitability criteria for infiltration treatment in Chapter 3 of Volume III.

If phosphorus control is not required, proceed to Step 5e. If phosphorus control is required, select one of the facilities below.

- Large sand filter;
- Large wetpond;
- Treatment train for phosphorus removal (—see Table 1.2); or
- Any other treatment system for which the Washington State Department of Ecology has issued a General Use Level Designation for phosphorus treatment.

Table 1.2 – Treatment Trains for Phosphorus Removal	
First Basic Treatment Facility	**Second Treatment Facility**
Biofiltration Swale	Basic Sand Filter or Sand Filter Vault
Filter Strip	Linear Sand Filter (no presettling needed)
Linear Sand Filter	Filter Strip
Basic Wetpond	Basic Sand Filter or Sand Filter Vault
Wetvault	Basic Sand Filter or Sand Filter Vault
Stormwater Treatment Wetland	Basic Sand Filter or Sand Filter Vault
Basic Combined Detention and Wetpool	Basic Sand Filter or Sand Filter Vault

Proceed to Step 5e to determine whether enhanced treatment is required. Projects for which phosphorus control is required may be subject to requirements for enhanced treatment as well, in which case a facility or treatment train must be selected that that satisfies both requirements.

Step 5e: Determine if enhanced treatment is required.

Unless excepted as stated below, enhanced treatment is required for the following project sites or portions of sites that discharge to fresh waters designated for aquatic life or that have existing aquatic life use, to conveyance systems tributary to such waters, or to stormwater infiltration systems that are not designed and constructed to provide treatment in accordance with the requirements of this manual and that are within ¼ mile of such waters:

- Industrial project sites;
- Commercial project sites;
- Multi-family project sites; and
- High ADT roads as follows:
  - Within Urban Growth Areas:
    - Fully controlled and partially controlled limited access roads with Average Daily Traffic (ADT) counts of 15,000 or more; and
    - All other roads with an ADT of 7,500 or greater;
  - Outside of Urban Growth Areas:
    - Roads with an ADT of 15,000 or greater unless discharging to a 4th Strahler order stream or larger; and
    - Roads with an ADT of 30,000 or greater if discharging to a 4th Strahler order stream or larger (as determined using 1:24,000 scale maps to delineate stream order).

Exceptions

For threshold discharge areas with more than one land use or activity, the enhanced treatment requirement shall apply to a threshold discharge area if 50 ~~percent~~% or more of the total runoff within that threshold discharge area is subject to the enhanced treatment requirements set forth above.

Projects or portions of projects meeting the descriptions above do not need enhanced treatment if the stormwater discharges directly or indirectly through a municipal storm sewer system to a water body listed in Volume I, Appendix I-C

If enhanced treatment is required, select one of the treatment systems below.

- Large sand filter;
- Stormwater treatment wetland;
- Compost-amended filter strip;
- Bioretention;
- ~~WSDOT media filter drain – see the 2014 Washington State Department of Transportation Highway Runoff Manual for design and construction requirements.~~ Media filter drain;
- Treatment train for dissolved metals removal (s~~S~~ee Table 1.3); or
- Any other treatment system for which the Washington State Department of Ecology has issued a General Use Level Designation for enhanced treatment.

Table 1.3 – Treatment Trains for Dissolved Metals Removal	
First Basic Treatment Facility	**Second Treatment Facility**
Biofiltration Swale	Basic Sand Filter or Sand Filter Vault or Media Filter(1)
Filter Strip	Linear Sand Filter with no presettling cell needed
Linear Sand Filter	Filter Strip
Basic Wetpond	Basic Sand Filter or Sand Filter Vault or Media Filter(1)
Wetvault	Basic Sand Filter or Sand Filter Vault or Media Filter(1)
Basic Combined Detention/Wetpool	Basic Sand Filter or Sand Filter Vault or Media Filter(1)
Basic Sand Filter or Sand Filter Vault with a presettling cell if the filter isn't preceded by a detention facility	Media Filter(1)
(1) Media must be approved by Ecology for enhanced treatment. See Volume V, Chapter 12.	

If Enhanced Treatment does not apply to the site, proceed to Step 5f.

Step 5f: Select a Basic Treatment Facility.

The Basic Treatment Menu applies to project sites for which treatment is required but which do not trigger the requirements for oil control, phosphorus control, or enhanced treatment listed in the step above. For developments with a mix of land use types, the basic treatment requirement shall apply when the runoff from the areas subject to the basic treatment requirement compose 50% or more of the total runoff within a threshold discharge area.

If basic treatment is required, select one of the following treatment systems:

- Infiltration treatment;
- Sand filter;
- Biofiltration swale;
- Filter strip;
- Basic wetpond;
- Wetvault – allowed only for commercial, industrial, or road projects if there are space limitations. Combined detention/wetvaults are allowed; see Volume V, Chapter 10.3;
- Stormwater treatment wetland;
- Combined detention and wetpool facilities;
- Bioretention;

- ~~WSDOT media filter drain – see the 2014 Washington State Department of Transportation Highway Runoff Manual for design and construction requirements.~~Media filter drain; or
- Any other treatment system for which the Washington State Department of Ecology has issued a General Use Level Designation for basic treatment.

Step 6: [Reserved]

Step 7: Complete Development of Permanent Stormwater Control Plan

SCC 30.63A.400 sets forth requirements for development of a permanent stormwater control plan. The design and location of the BMPs and facilities on the site must be determined using the requirements in Volumes III, IV, and V.

Appendix I-A - RESERVED

Appendix I-B - RESERVED

Appendix I-C
Basic Treatment Receiving Waters

Stormwater discharges to the following receiving waters require only basic stormwater treatment

All Salt Waterbodies

Rivers	**Basic Treatment Applies Below This Location**
Sauk	Clear Creek
Skagit	Cascade River
Skykomish	Beckler River
Snohomish	Snoqualmie River
Snoqualmie	Middle and North Fork Confluence
Stillaguamish	North and South Fork Confluence
North Fork Stillaguamish	Boulder River
South Fork Stillaguamish	Canyon Creek
Suiattle	Darrington

Note: ~~-~~The initial criteria for this list are rivers whose mean annual flow exceeds 1,000 cfs, and lakes whose surface area exceeds 300 acres. Additional waters do not have to meet these criteria, but they should have sufficient background dilution capacity to accommodate dissolved metals additions from build-out conditions in the watershed under the latest Snohomish County Comprehensive ~~Land Use~~ Plan and zoning regulations.

Appendix I-D
Wetlands ~~and Stormwater Management~~Protection Requirements

These requirements are intended to prevent diminishment of the functions and values of wetlands by avoiding alterations to the structural, hydrologic, and water quality characteristics of existing wetlands to the extent feasible during new development, redevelopment, and stormwater management projects.

New development, redevelopment, and stormwater management projects may decrease the function and value of a wetland by:

- Increasing the amount of water flow discharged to a wetland.
- Decreasing the amount of water flow discharged to a wetland.
- Increasing the amount of pollutants discharged to a wetland.

This can happen even if the wetland is not physically altered for development or stormwater management purposes.

A. Wetland Rating System

A wetland identified as a receiving water of a project needs to be rated using the Washington State Wetland Rating System for Western Washington: 2014 Update (see Thomas Hruby, Washington State Wetland Rating System for Western Washington: 2014 Update, Publication #14-06-029, SEA Program, Washington Department of Ecology, 2014.) to determine its category and habitat score.

Wetlands in Washington s~~S~~tate differ widely in their functions and values. The Washington State Wetland Rating System categorizes wetlands into four categories (I, II, III and IV) based on their sensitivity to disturbance, their rarity, our ability to replace them, and the functions they provide. Category I is the highest rated wetland and the most sensitive to disturbance and Category IV wetlands are the lowest rated, based on relatively low functions and values.

This Appendix uses categories and habitat scores for wetlands to determine the level of protection necessary to reduce the risk of loss of wetland functions and values. The rating system does not replace a full assessment of wetland functions that may be necessary if wetlands are impacted and mitigation permits are required. For more information on the wetlands rating system refer to the following webpage:

https://ecology.wa.gov/Water-Shorelines/Wetlands/Tools-resources/Rating-systems

B. Regulatory Authority

Wetlands are Waters of the State as defined under Chapter 90.48 RCW, Surface Waters of the State under Chapter 173-201A WAC, and may be Waters of the U.S. according to the 2015 Clean Water Rule and regulated under the Clean Water Act. This Appendix does not include guidance for wetland delineation, assessment, permitting, or restoration.

Every development project should follow the requirements of the State Environmental Policy Act. Proponents should contact the local permitting authority and any other agency that deals with wetland protection. Other state and federal agencies may also have jurisdiction over projects affecting wetlands such as the Washington State Departments of Ecology, Natural Resources, and Fish & Wildlife; the U.S. Environmental Protection Agency; and the U.S. Army Corps of Engineers.

C. Wetland Protection Levels

The level of protection required for existing wetlands is based on the wetland category, habitat score, and the wetland characteristics. The levels of wetland protection outlined are as follows:

General Protection

All wetlands (Categories I, II, III and IV) must receive the following general protection:

- Consult regulations issued under federal and state laws that regulate the discharge of pollutants to surface waters, including the Construction Stormwater General NPDES Permit.
- Maintain the wetland buffer required by local and/or state regulations.
- Retain areas of native vegetation connecting the wetland and its buffer with nearby wetlands and other contiguous areas of native vegetation.
- Avoid compaction of soil and introduction of invasive plant or animal species in the wetland and its buffer.
- Take measures to avoid general physical impacts (e.g., littering and vegetation destruction). Examples are protecting existing buffer zones; discouraging access, especially by vehicles, by planting outside the wetland, and encouragement of stewardship and signage by landowners.
- Any stormwater management practices, such as Runoff Treatment or Flow Control BMP implementation, must be done outside of the wetland buffer boundary, except limited circumstances where the wetland and/or buffer may be used for additional Runoff Treatment and/or Flow Control of stormwater (See Section I – Compensatory Mitigation of Wetlands)
- Discharge from a BMP or project site should be dispersed using a method to diffuse the flow before entering the wetland buffer.
- Consider fences to restrict human access, but make sure it doesn't interfere with wildlife movement. They should be used when wildlife passage is not a major issue and the potential for intrusive impacts is high. When wildlife movement and intrusion are both issues, the circumstances will have to be weighed to make a decision about fencing. Check with the local and/or state agencies to determine if fencing would be allowed.

Protection from Pollutants

All wetlands (Categories I, II, III and IV) must receive the following protection from pollutants:

- Provide Construction Stormwater BMPs as directed in Minimum Requirement 2 to prevent sediment and other pollutants from entering the wetland.
- Provide Source Control BMPs as directed in Minimum Requirement 3.

- Provide On-Site Stormwater Management and use LID principles as much as practicable for the site, as directed in Minimum Requirement 5.
- Provide Runoff Treatment BMPs as directed in Minimum Requirement 6 to treat runoff prior to entering the wetland and its buffer. If the thresholds for Minimum Requirement 6 are not met for a threshold discharge area, then it is not required to provide Runoff Treatment BMPs for that threshold discharge area to comply with Minimum Requirement 8.

If the wetland is a special characteristic wetland (such as mature or old growth forest wetlands, bogs, estuarine wetlands, wetlands of high conservation value, coastal lagoons, and interdunal wetlands), implement Runoff Treatment BMPs with the most advanced ability to control nutrient loads. Consider using Runoff Treatment BMPs with infiltration and active biological filtration.

Wetland Hydroperiod Protection

Protection of many wetland functions and values depends on maintaining the existing wetland's hydroperiod. This means maintaining the annual fluctuations in water depth and its timing as closely as possible. If a threshold discharge area triggers the requirements for Flow Control BMPs per Minimum Requirement 7, the following Wetland Hydroperiod Protection must be applied for the same threshold discharge area.

The Wetland Hydroperiod Protection is separated into two methods (Methods 1 and 2) that are dependent on the wetland category, and whether the project proponent has legal access to the wetland.

Method 1 requires a minimum one year of monitoring followed by continuous simulation modeling of the wetland stage. This method shall be applied to Category I or II depressional or riverine impounding (including special characteristics Category I or II) wetlands that the project proponent owns, or the project proponent has legal access to – for purposes of conducting monitoring in the wetland.

Method 1 takes into account wetland specific information and field data, therefore, it allows more detailed evaluation of effects of stormwater on wetland functions. In cases where the project proponent neither owns nor has legal access to the Category I or II wetlands receiving stormwater from a proposed project, Method 2 shall be used.

Method 2 uses a site discharge volume model to evaluate hydrologic changes in a wetland, with no additional wetland monitoring requirement. Method 2 shall be applied to the wetlands listed below.

- Category I or II wetlands that are off-site or the project proponent doesn't have legal access to conduct monitoring in the wetland,
- Category I or II riverine, slope or lake-fringe wetlands,
- Category III and IV wetlands with habitat score greater than 5,
- Category III or IV interdunal special characteristic wetlands,
- Category III and IV wetlands that provide habitat for rare, threatened, endangered or sensitive species,

- Category III and IV wetlands that contain a breeding population of any native amphibian species.
    - If the wetland has permanent or seasonal ponding or inundation, assume that it has a breeding population of native amphibians.
    - For seasonal ponding, if the wetland has surface ponding after May 1 of a normal water year or drier, assume that it has a breeding population of native amphibians.
    - See the Wetland Rating System for guidance on identifying field indicators.
    - Recent aerial images of surface water in the wetland during normal water year or drier year can also indicate presence of permanent or seasonal ponding.
    -

D. Wetland Hydroperiod Protection Method 1: Wetland Monitoring and Wetland Stage Modeling

Method 1 criteria and analysis is based on the presumption that a wetland has limited water level fluctuation and water holding capacity. The risk to the wetland will be minimal if the frequency and duration of water level fluctuation (WLF) in the wetland and the WLF timing post project remain as similar to pre-project levels as possible. Therefore, the criteria sets limits on the frequency and duration of stage excursions (greater WLF than the pre-project level), as well as on overall WLF after development. The criteria were developed based on studies in Wetlands and Urbanization, Implications for the Future (Amanda L. Azous and Richard R. Horner (eds.), Wetlands and Urbanization, Implications for the Future, Final Report of the Puget Sound Wetlands and Stormwater Management Research Program, 1997.).

One water year of field monitoring will characterize the existing WLF and water holding capacity of the wetland, and it will be used to calculate the allowable WLF by the proposed development.

A hydrologic assessment to measure or estimate elements of the hydroperiod under pre-project and post-project conditions should be performed with the aid of a qualified scientist or wetland specialist.

Criteria for Method 1

The project proponent must meet the following six Method 1 criteria in order to comply with the Wetland Hydroperiod Protection requirements.

Criteria 1. Mean Monthly WLF Limit

- If the pre-project (monitored) mean monthly WLF for a given calendar month is < 15cm (0.49ft, 5.91inch), the post-project mean WLF of the wetland for that calendar month may increase to no more than 20 cm (0.66ft, 7.87inch).
- If the pre-project (monitored) mean monthly WLF for a given calendar month is ≥ 15 cm (0.49ft, 5.91inch), the post-project mean monthly WLF of the wetland for that calendar month may increase by up to, but no more than, 5 cm (0.16ft, 1.97inch).

- Without one year of monitoring data, assume the pre-project mean monthly WLF for any month is ≥ 15 cm (0.49ft, 5.91inch), and the post-project mean monthly WLF of the wetland for that calendar month may increase by up to, but no more than, 5 cm (0.16ft, 1.97inch).

Criteria 2. Mean Annual WLF Limit

- If the pre-project (monitored) mean annual WLF is < 15cm (0.49ft), the post-project mean annual WLF of the wetland may increase to no more than 20 cm (0.66ft, 7.87inch).
- If the pre-project (monitored) mean annual WLF is ≥ 15 cm (0.49ft, 5.91inch), the post-project mean annual WLF of the wetland may increase by up to, but no more than, 5 cm (0.16ft, 1.97inch).
- Without one year of monitoring data, assume the pre-project mean annual WLF is ≥ 15 cm (0.49ft, 5.91inch), and the post-project mean annual WLF of the wetland may increase by up to, but no more than, 5 cm (0.16ft, 1.97inch)

Criteria 3. Frequency of Stage Excursions

- The frequency of stage excursions of 15 cm (0.49ft, 5.91inch) above or below the pre-project stage must not exceed an annual average of six.

Criteria 4. Durations of Stage Excursions

- The duration of stage excursions of 15 cm (0.49ft, 5.91inch) above or below the pre-project stage must not exceed 3 days per excursion.

  AND

  - For a Wetland that Provides Habitat for Native Amphibians: The stage excursions above or below the pre-project stage must not exceed 8 cm (0.26ft, 3.15inch) for more than 1 day in any 30-day period between January 1 and May 31. The hydroperiod limits characterize wetlands inhabited by breeding native amphibians and apply to breeding zones during the period of January 1 through May 31. If these limits are exceeded, then amphibian breeding success is likely to decline.

  OR

  - For a Peat Wetland: The duration of stage excursions in the post-project scenario cannot be above the pre-project stage for more than 1 day in any year, and applies to all zones over the entire year. If this limit is exceeded, then characteristic bog or fen wetland vegetation is likely to decline.

Criteria 5. Total Dry Period Change

- The total dry period (when pools dry down to the soil surface everywhere in the wetland) must not increase or decrease by more than two weeks in any year between the pre-project and post-project scenarios.

Criteria 6. Perennial to Ephemeral or Seasonal Avoidance

- Alterations to watershed and wetland hydrology that may cause perennial wetlands to become ephemeral or seasonal post-project must be avoided.

- If modeled wetland stage indicates that the wetland is perennial, the dry period at the post-project scenario should not exceed 1 day in any year.

Additional guidance to assist with the calculations to verify compliance with Method 1 is provided in Section F – Wetland Hydroperiod Data Collection and Evaluation Procedures for Method 1.

E. Wetland Hydroperiod Protection Method 2: Site Discharge Modeling

An alternative way to predict the risk to the wetland hydroperiod from stormwater discharges is to assess the changes in total volume of flows into a wetland that result from the development project. The size of the wetland and its capacity are not known or needed to utilize Method 2. The risk to wetland functions will be assumed to increase as the total discharge volumes from the site into the wetland diverge from the pre-project conditions. The risk will be decreased if the divergence is smaller.

As stormwater generated at the project site passes through the wetland buffer, total discharge volumes from the site to the wetland are to be calculated at the outflow of the wetland buffer. The existing or required length and area of wetland buffer per local and/or state regulations around the wetland should be included as an element in the model under both pre-project (existing) and post-project scenarios.

Criteria for Method 2

The project proponent must ensure they are meeting both of the following Method 2 criteria in order to comply with Wetland Hydroperiod Protection.

Criteria 1. Mean Daily Total Discharge Volumes from the Site

- Total volume of water into a wetland on daily basis should not be more than 20% higher or lower than the pre-project volumes.
    - Calculate the average of the total discharge volumes from the site for each day over the period of precipitation record in the approved continuous runoff hydrologic model for pre- and post-project scenarios. There will be 365 (366 for a leap year) average daily values for the pre-project scenario and 365 (366 for a leap year) for the post-project. No day can exceed 20% change in volume.

Criteria 2. Mean Monthly Total Discharge Volumes from the Site

- Total volume of water into a wetland on a monthly basis should not be more than 15% higher or lower than the pre-project volumes.
    - Calculate the average of the monthly total discharge volumes from the site for each calendar month over the period of precipitation record in the approved continuous runoff hydrologic model for pre- and post-project scenarios. No month can exceed 15% change in volume.

The guidance for implementing Method 2 and assessing the criteria above in the respective model is provided in Section G – Wetland Hydroperiod Data Collection and Evaluation Procedures for Method 2.

Limitations

Method 2 may not result in complete protection of wetland functions and values as these criteria are based on risk to the resource rather than an actual understanding of the impacts. When applicable, Ecology recommends application of the Wetland Hydroperiod Protection with wetland-specific monitoring as described in Method 1.

F. Wetland Hydroperiod Data Collection and Evaluation Procedures for Method 1

Field Monitoring and Data Collection

Field monitoring data of the wetland must be collected to determine the existing pre-project hydroperiod, which will then be compared to model outputs to verify compliance with the Hydroperiod Protection Criteria. Without one year of hydroperiod monitoring, the minimum allowable WLF change can be used (see Criteria for Method 1 in Section D – Wetland Hydroperiod Protection Method 1: Wetland Monitoring and Wetland Stage Modeling as well as Steps to Verify Compliance with the Method 1 Hydroperiod Protection Criteria below).

An approved continuous runoff hydrologic model will be needed for data analysis. Relevant historic monitoring information can also inform the pre-project condition of the wetland. The following lists describe the minimum required wetland specific information in order to implement the Method 1 Wetland Hydroperiod Protection requirements.

1. Contour Data or Water Storage Capacity

Bathymetry, or wetland contours, is indicative of the water storage capacity of the wetland that will be used in the model simulation. If possible, the bathymetry of the wetland should be surveyed. LIDAR data or GIS analysis may also be used to provide approximate wetland contours. In the absence of bathymetry data, approximate the bathymetry using the permanent ponding area and assume that the storage will occur on top of that area. This resulting storage area will be lower than the actual area, providing a more protective model.

2. Hydroperiod Monitoring

Collect at least one year of water levels (instantaneous water stage and crest stage) using a crest stage gage or continuous water level loggers in the wetland. Water levels should be collected at least monthly over a year.

Average base stage = (Instantaneous stage at the beginning of interval + Instantaneous stage at the end of interval)/2

3. Flow Monitoring

The goal of this monitoring is to construct a relationship in the model to simulate how flows will be released from the wetland for each given stage. A simplified monitoring approach may be appropriate for a simple wetland flow regime. For instance, where a well-defined outlet controls the outflows from a wetland, instantaneous monitoring of the outflow for the typical range of

flows may be sufficient. In this simple case, a velocity and cross-section and stage monitoring at the outlet can be sufficient to create the relationship for the model. These measurements may be performed in conjunction with the hydroperiod monitoring described above. Additional field visits timed with precipitation or dry periods may be necessary to ensure that the outflow relationship covers the range of modeled flows.

In some situations it may be challenging to determine the location(s) of flows to and from wetlands. In some cases, there will be a clear channel that is the source of the inflows and outflows, while in others, the water may disperse over a wide area. An alternative would be to gather nearly continuous (every 15 minute) rainfall data along with wetland stage data (hydroperiod monitoring) and adjust the storage and discharge rate within the model using these data. If the flow data or estimation in the model are not available, assume there is no surface outflow for the wetland (closed depression).

Chapter 8 of Wetlands and Urbanization, Implications for the Future (Amanda L. Azous and Richard R. Horner (eds.),Wetlands and Urbanization, Implications for the Future, Final Report of the Puget Sound Wetlands and Stormwater Management Research Program, 1997) indicates that a complete wetland water balance includes precipitation, evapotranspiration, surface inflow, surface outflow, groundwater exchange, and change in wetland storage using a tipping-bucket gage and continuous flow measurements. The wetland assessment as part of this Method 1 needs to consider the more protective approach to develop that relationship. A scientist (e.g. wetland scientist or hydrologist) may determine that the groundwater flow is a significant characteristic of the outflow of the system. In this case the project proponent may need to determine the groundwater regime of the system.

Model Construction and Simulation

The project proponent should develop a stage-storage-discharge (SSD) table that represents the volume of water that ponds in the wetland and the flow rate of water that discharges from the wetland at a given stage. Having a reliable SSD table that represents the wetland is essential to evaluate the effects of development in the model. Wetland bathymetry and contour data by field measurement or using equations to represent the volume-area-depth relations of wetlands and wetland flow monitoring data are critical to develop the SSD table for the wetland.

In the absence of actual wetland flow monitoring data, it may be possible to develop a SSD table for the wetland by combining the model simulated flows with the field data obtained on the wetland WLF (hydroperiod monitoring) data. This would require an iterative modeling process. The modeling iterations would involve manually changing the discharge rates in the SSD table until the resulting simulated WLF approach WLF from the field monitoring data. The project proponent or modeler should provide the details of how this estimated in its hydrologic assessment report, so that it can be reviewed by Snohomish County.

With an SSD table, the following are necessary for the model simulation to evaluate the discharge of development in the model and determine compliance with the Method 1 Wetland Hydroperiod Protection criteria.

- Pre-project condition land uses and associated acreage for the entire contributing area that drains to the wetland.

- Post-project condition land uses and associated acreage for the entire contributing area that drains to the wetland.
- Percentage of developing project area compared to total acreage of contributing area that drains to the wetland.

Pre-Project Simulation

1. Identify existing impervious and pervious surfaces that discharge to the wetland and use the model elements to represent the land use and associated acreage for all hydrologically contributing areas to the wetland.
2. Add the wetland buffer using the lateral flow soil basin, or include it as part of the contributing area land use.
3. Connect the runoff from the contributing basin(s) including interflow and groundwater to the SSD table that represents the wetland.
4. Set the outflow of the wetland as the Point of Compliance (POC).

Post-Project Simulation

1. Identify anticipated impervious and pervious surfaces that discharge to the wetland and use the model elements to represent the land use and associated acreage for all hydrologically contributing areas to the wetland.
2. Identify any Flow Control BMPs in the contributing area draining to the wetland and use the appropriate model elements to represent these facilities.
3. Add the wetland buffer using the lateral flow soil basin, or include it as part of the contributing area land use.
4. Connect the runoff from the contributing basin(s) (including the buffer) including interflow and groundwater to the same SSD table that was used in the pre-project scenario.
5. Connect flows from any Flow Control BMP elements through the downstream element(s) to SSD table that represents the wetland.
6. Connect any infiltration from Flow Control BMP elements to groundwater of SSD table (if applicable).
7. Set the outflow of the wetland as the POC.

The order of the steps above depends on the type of elements and their intended function and could change to be more representative of the contributing flow pathways to the wetland.

Once the model simulations are done for pre- and post-project scenarios, export the SSD table stage data for the full period of record: daily, monthly and yearly average, and Max and Min stage.

These model outputs, together with monitored WLF, are to be used to verify compliance with the Method 1 Hydroperiod Protection Criteria in Section D – Wetland Hydroperiod Protection Method 1: Wetland Monitoring and Wetland Stage Modeling.

Steps to Verify Compliance with the Method 1 Hydroperiod Protection Criteria

Ecology has provided an Excel template to assist with the calculations in the steps below. The template can be downloaded from: https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/Content/Resources/DocsForDownload/WetlandsMethod1Template_6-18-19.xlsx

1) Calculate the Existing WLF of Wetland using Monitored Water Levels

- Using the measurements of crest and instantaneous stage during a series of time intervals over a year, calculate water level fluctuation (WLF) between measurements.
- Calculate mean annual and mean monthly WLF as the arithmetic averages of a year and each month for which data are available.

Water level fluctuation (WLF) = Crest stage - Average base stage

2) Estimate the WLF by Continuous Simulation of Stages in the Model

- Using modeled daily, monthly and yearly stages (average, max and min) for the full period of record, calculate daily, monthly or annual WLF as follows:

WLF = Max stage - average stage

3) Calculate Allowable WLF change

- Allowable WLF change by the proposed project is determined by two factors: Monitored WLF of the wetland, and the size of the proposed project relative to the wetland's contributing basin area.
- Allowable WLF change for the proposed project is calculated as follows:
    - If monitored WLF is < 15 cm (0.49 ft, 5.91 inch),
        - Allowable WLF change for the wetland (A) = 20 cm (0.66 ft, 7.87 inch) – monitored WLF
        - Allowable WLF change for the proposed project = A / percentage of development by proposed project in the contributing basin area.
    - If monitored WLF for a given calendar month is ≥ 15 cm (0.49 ft, 5.91 inch),
        - Allowable WLF of the wetland (A) for that calendar month may increase by up to, but no more than, 5 cm (0.1 6ft, 1.97 inch).
        - Allowable WLF change for the proposed project = 5 cm / percentage of development by proposed project in the contributing basin area.
- For example, if the project develops 10 acres of a 100 acre basin (10 %), the project can cause no more than 10 % of total allowable WLF change in the wetland. If the total allowable WLF change for the wetland is 10 cm (0.32 ft, 3.94 inch), the allowable WLF change for the proposed site is 1.0 cm (0.032 ft, 0.394 inch).

4) Verify Compliance with the Criteria

- Compare each modeled daily, monthly or annual WLF with the calculated allowable WLF (factored by percentage of development by proposed project in the contributing

basin area). If any of the modeled WLF difference between pre-project and post-project scenarios exceeds the calculated allowable WLF change for the proposed project, it means the proposed project does not comply with Method 1 Wetland Hydroperiod Protection.

- For criteria about durations and frequencies, assess individual modeled stage outputs to verify compliance.

G. Wetland Hydroperiod Data Collection and Evaluation Procedures for Method 2

Model Construction and Simulation

When modeling, include the wetland buffer as the final element in both pre- and post-project scenarios, downstream of the project area including any Flow Control BMPs. The point of compliance (POC) should be assigned to capture the total (surface, interflow, and ground water) volume leaving the wetland buffer for both the pre-project and the post-project scenarios.

Pre-project simulation

1. Identify existing impervious and pervious surfaces that discharge to the wetland and use the model elements to represent these land areas.
2. Identify the wetland buffer area and use the lateral flow soil basin to represent the wetland buffer.
3. Connect the model elements to the wetland buffer ensuring that impervious land areas are connected to surface flows and that for any other model elements all flows (surface, interflow, and ground water) are connected.
4. Set the wetland buffer element as the most downstream element.
5. Set the POC at the outflow of the wetland buffer element including surface runoff, interflow, and ground water.

Post-project simulation

1. Identify anticipated post-project impervious and pervious surfaces that discharge to the wetland and use the model elements to represent these land areas.
2. Identify any Flow Control BMPs and use the appropriate the model elements to represent these facilities.
3. Identify the wetland buffer area and use the lateral flow soil basin to represent the wetland buffer.
4. Connect the model elements to the wetland buffer ensuring that impervious land areas are connected to surface flows and that for any other model elements all flows (surface, interflow, and ground water) are connected.
5. Connect any Flow Control BMP elements to the wetland buffer ensuring that surface flows are connected to surface water and any infiltration is connected to ground water.
6. Set the wetland buffer element as the most downstream element.

7. Set the POC at the outflow of the wetland buffer element including surface runoff, interflow, and ground water.

Once the model simulations are done for pre- and post-project scenarios, verify compliance with the Method 2 Hydroperiod Protection Criteria.

H. Strategies to meet the Wetland Hydroperiod Protection Criteria

Consider the following strategies to minimize impacts on the wetland hydroperiod and to meet the criteria. The list is in order of preference:

- Increasing the retention of natural pervious cover.
- Reducing the level of development.
- Reducing the total amount of impervious surfaces.
- Increasing infiltration using on-site LID techniques.
- Increasing or maintaining larger wetland buffer zones.
- Increasing infiltration and/or storage capacity of Flow Control BMPs.

I. Compensatory Mitigation of Wetlands

It is always necessary to treat stormwater prior to discharge to a wetland and its buffer. Any required Runoff Treatment BMPs, including the outlet structure, must be provided outside of the wetland and its buffer boundaries. If outflow from a BMP or project site is concentrated, flow should be diffused prior to discharge into the buffer.

Compensatory Mitigation Required

When project proponents alter a wetland(s) as part of a Runoff Treatment and/or Flow Control BMP system, they must demonstrate that they have done everything possible to avoid and minimize impacts. Remaining impacts to wetland area and/or functions must be compensated according to local, state, and federal regulations and guidelines. Check with the agencies responsible for issuing permits.

Compensatory Mitigation Not Required

Treated stormwater may be beneficial to wetlands that have been heavily disturbed by human activities and can improve wetland hydrologic functions. In these limited cases when all of the conditions below are met, hydrologic alteration of the wetland to meet the requirements of a Flow Control BMP/facility is allowed without compensatory mitigation. This alteration will be considered a hydrologic functional restoration activity.

- The wetland is rated Category III or IV.
- The wetland has a habitat score of 5 or less.
- The wetland does not provide habitat for rare, threatened or endangered species.
- The wetland does not contain a breeding population of any native amphibians.

- The hydrologic functions of the wetland can be improved by modification. Generally, this means that constraints exist within the wetland (or surrounding area) that have altered natural hydrologic processes. The constraints are described in Charts 4 & 5 in Selecting Wetland Mitigation Sites Using a Watershed Approach (Thomas Hruby et al., Selecting Wetland Mitigation Sites Using a Watershed Approach, Washington State Department of Ecology, 2009). Proponents must identify and address at least one of the following common constraints to document improvement of hydrologic functions:
    - Surface water flows have been diverted away from the wetland by prior development. Surface/subsurface water flows could be directed to the site to augment hydrologic inputs.
    - Ditches that artificially drain water from the wetland could be filled or plugged to retain water.
    - Drain tiles that artificially drain water from the wetland could be broken or removed to retain water.
    - Artificially placed fill that decreases surface water storage capacity could be removed to increase surface water storage capacity.
    - Dikes or berms that prevent overbank flooding could be breached or removed.
    - Outlet culvert that is lower than the surrounding topographic depression could have its invert elevation raised to increase surface water storage
    - The wetland is part of a priority restoration plan that achieves restoration goals identified in a Shoreline Master Program or other local or regional watershed plan.
- The wetland lies in the natural route of water and the discharge follows the natural routing.
- Successful demonstration that no net loss of wetland function and value occurs as a result of the structural or hydrologic modifications.
    - This includes the impacts from the machinery used for the construction. Heavy equipment can damage the soil structure of a wetland.
    - When the functions and values of a degraded wetland are improved by project alterations, the project proponent must specify which project activities would thus be self-mitigating.
    - Check with the agency(ies) issuing the permits for the modification(s) to determine which method(s) and/or analyses to use to determine no net loss of wetland functions and values.
    - Functions and values that are not replaced on site will have to be compensated for elsewhere.

J. Wetland Protection Definitions

The following terms are applicable only to this Appendix.

Buffer

The area (either upland, open water, or another wetland) that surrounds a wetland or watercourse and that reduces adverse impacts to the ecosystem functions and values from adjacent development.

Compensatory mitigation

The stage of the mitigation sequence where impacts to wetland functions are offset (i.e., compensated for) through creation (establishment), restoration (re-establishment, rehabilitation), or enhancement of other wetlands. Because regulatory requirements and policies tend to focus on compensatory mitigation, the term "mitigation" is often used to refer to compensation, which is just one part of the overall mitigation sequence.

Degraded wetland

A wetland (community) whose functions and values have been reduced as a result of human activities. For example, a wetland in which the vegetation, soils, and/or hydrology have been adversely altered, resulting in lost or reduced functions and values; generally, implies topographic isolation; hydrologic alterations such as hydroperiod alteration (increased or decreased quantity of water), diking, channelization, and/or outlet modification; soils alterations such as presence of fill, soil removal, and/or compaction; accumulation of toxicants in the biotic or abiotic components of the wetland; and/or low plant species richness with dominance by invasive weedy species.

Depressional wetland

Depressional wetlands occur in topographic depressions where the elevation of the surface within the wetland is lower than in the surrounding landscape. These wetlands often pond water at the surface but they can also be saturated without surface ponding.

Ephemeral wetland

Wetlands that temporarily hold water in the spring and early summer or after heavy rains. Periodically, these wetlands dry up, often in mid to late summer.

Estuarine wetland

Wetlands where salt tolerant plant species are dominant and the water regime is influenced by tidal action. The wetlands are usually partially enclosed by land with open, or partially obstructed access to open saline water. Salinity is greater than 0.5 ppt.

Hydroperiod

The seasonal occurrence of flooding and/or soil saturation; it encompasses the depth, frequency, duration, and seasonal pattern of inundation.

Invasive species

Nonnative organisms whose introduction causes or is likely to cause economic or environmental harm or harm to human, animal or plant health.

Lake Fringe Wetlands

Lake Fringe wetlands are on the water side of the Ordinary High Water Mark (OHWM) of lakes where the area of open water next to a vegetated wetland is larger than 20 ac (8 ha), and more than 6.6 ft deep (2 m) over 30% of the open water areas.

Peat Wetland

Unique, irreplaceable bogs and fens that can exhibit water pH in a wide range from highly acidic to alkaline, including fens typified by Sphagnum species, Rhododendron groenlandicum (Labrador tea), Drosera rotundifolia (sundew), and Vaccinium oxycoccos (bog cranberry); marl fens; estuarine peat deposits; and other moss peat systems with relatively diverse, undisturbed flora and fauna. Bog is the common name for peat systems having the Sphagnum association described, but this term applies strictly only to systems that receive water income from precipitation exclusively.

Perennial Wetland

Wetlands where at least a portion of their area has permanent surface water (i.e., flooded or

Rare, threatened, endangered, or sensitive species

Plant or animal species that are relatively uncommon regionally, are nearing endangered status, or whose existence is in jeopardy and is usually restricted to highly specific habitats. Threatened, endangered or sensitive species are listed by federal or state authorities, whereas rare species are unofficial species of concern that fit the above definitions.

Rehabilitation

The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural or historic hydrologic functions and processes of a degraded wetland. Rehabilitation results in a gain in wetland function but does not result in a gain in wetland area.

Riverine impounding wetland

Riverine impounded wetlands retain surface water significantly longer than the duration of the flood event. Riverine impounded wetlands tend to hold water for more than a week after a flood event. These wetlands are found in a topographic depression on the valley floor, or in areas where natural or human made barriers to downstream flow occur.

Riverine wetlands

Riverine wetlands occur in valleys associated with stream or river channels. They lie in the active floodplain of a river, and have important hydrologic links to the water dynamics of the river or stream. The distinguishing characteristic of riverine wetlands in Washington is that they are frequently flooded by overbank flow from the stream or river.

Seasonal wetland

A wetland that has water above the soil surface for a period of time (usually between two months to less than one year) during and/or after the wettest season but in typical years dries to or below the soil surface in warmer, drier weather.

Slope Wetlands

Slope wetlands occur on slopes where groundwater surfaces and begins running along the surface, or immediately below the surface. Water in these wetlands flows only in one direction (down the slope) and the gradient is steep enough that the water is not impounded. The downhill side of the wetland is always the point of lowest elevation in the wetland.

Stage excursion

A post-project departure, either higher or lower, from the water depth existing under a given set of conditions in the pre-development state.

Water Level Fluctuation (WLF)

This is a defining characteristic of a wetland. Water level fluctuation (WLF) during a monitoring interval is as follows:

Average base stage = (Instantaneous stage at beginning of interval + Instantaneous stage at end of interval)/2

Wetland functions

The ecological (physical, chemical, and biological) processes or attributes of a wetland. Functions are often defined in terms of the processes that provide value to society, but they can also be defined based on processes that are not value based. Wetland functions include food chain support, provision of ecosystem diversity and fish and wildlife habitat, flood flow alteration, ground water recharge and discharge, water quality improvement, and soil stabilization.

Wetland values

Wetland processes or attributes that are valuable or beneficial to society (also see Wetland functions). Wetland values include support of commercial and sport fish and wildlife species, protection of life and property from flooding, recreation, education, and aesthetic enhancement of human communities.

Wetlands

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention BMPs, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands. (Waterbodies not included in the definition of wetlands as well as those mentioned in the definition are still waters of the state.)

~~SCC 30.63A.570 requires use of the following criteria and methods for determining whether a wetland can be used as a stormwater flow control or treatment facility, and the requirements that must be met if such use is allowed.~~

~~**A. Wetlands that shall not be used as stormwater treatment and flow control facilities, and requirements for discharging stormwater to such wetlands.**~~

~~A wetland shall not be used as a stormwater treatment or flow control facility if:~~

- ~~The wetland is a Category I or Category II wetland as determined by the Washington State Wetland Rating System of Western Washington (Washington State Department of Ecology, 2006);~~ ~~OR~~

- The wetland provides habitat for threatened or endangered species.

Stormwater from a development project shall not be discharged to a wetland meeting any of the criteria above unless ALL of the following criteria are met:

- Stormwater flow control is provided for the discharge in accordance with SCC 30.63A.550;
- Stormwater treatment is provided for the discharge in accordance with SCC 30.63A.530; AND
- Both of the following criteria are met:
    - Criterion 1: using the 2012 Western Washington Hydrology Model (WWHM 2012) or an equivalent continuous simulation hydrologic model and a minimum 50-year precipitation record, the average daily influent runoff volume into the wetland for pre-project conditions shall not deviate from the average daily influent runoff volume into the wetland for post-project conditions by more than 20%. See section I.C.3 below for details; AND
    - Criterion 2: using the 2012 Western Washington Hydrology Model (WWHM 2012) or an equivalent continuous simulation hydrologic model and a minimum 50-year precipitation record, the average monthly influent runoff volume into the wetland for pre-project conditions shall not deviate from the average monthly influent runoff volume into the wetland for post-project conditions by more than 15%. See section I.C.3 below for details.

NOTE: the term "pre-project conditions" means the conditions existing on the site before the proposed project. It does not mean "predevelopment conditions" as that term is used elsewhere in this manual.

B. Wetlands that can be physically or hydrologically altered to provide stormwater treatment or flow control, and requirements for stormwater discharges to such wetlands.

A wetland can be physically or hydrologically altered to provide stormwater treatment or flow control BMP/facility if ALL of the following criteria are met:

- The wetland is classified in Category IV as determined by the Washington State Wetland Rating System of Western (Washington State Department of Ecology, 2006) or is classified in Category III of that rating system with a habitat score of 19 points or less;
- The applicant demonstrates to the satisfaction of Snohomish County that there will be no net loss of functions and values of the wetland as a result of the structural or hydrologic modifications done to provide control of runoff and water quality;
- The wetland does not contain a breeding population of any native amphibian species;
- The wetland lies in the natural routing of the runoff, and the discharge follows the natural routing; and
- At least one of the following conditions is met and all relevant actions in Table I.D-1 are taken:

- The wetland contains ditches that can be filled or drain tiles that can be broken or blocked;
- The wetland contains fill that can be removed to increase surface storage in a manner that has a positive effect on water quality or habitat;
- The wetland is drained by a culvert that can be raised to increase surface storage in a manner that has a positive effect on water quality or habitat;
- The wetland is in a floodplain, is protected from overbank flooding by a dike, and the dike can be breached.

Table I.D-1 Actions to Improve Hydrologic Functions and Water Quality in Wetlands

Condition	Action(s)
Ditches can be filled or drain tiles can be broken or blocked	Break or block drain tiles Fill ditches to surface elevation; do not lean depressions that can channel water
Fill can be removed	Remove fill using equipment with a ground pressure less than 2 lb/ square inch
Culvert invert(s) can be raised to increase surface storage	Raise culvert inverts
Dike(s) can be breached	Breach dike(s) so as to reduce velocity of influent flood water during flood events and to reduce erosion on dike edges

If the wetland inlet will be modified, use a diffuse flow method, (e.g. BMP C206 Level Spreader Swale, Volume II, and BMP T5.10B Downspout Dispersion Systems, Volume III) to discharge water into the wetland in order to prevent flow channelization.

C. Methods for determining compliance with criteria set forth in Section A

Use the following procedure for determining compliance with Criterion 1 (variance in average daily influent volume).

1. Calculate the daily runoff volume for each calendar day (e.g., April 1) in the precipitation record for both pre-project and post-project conditions. Volumes shall be calculated at the inflow to the wetland or the upslope edge where surface runoff, interflow, and ground water enter.
2. For each calendar day, calculate the multi-year average of the daily runoff volume values for both pre-project and post-project conditions. This calculation will yield two values (pre-project and post-project) for each calendar day.

3. For each calendar day average, compare the pre-project and post-project values. The criterion is satisfied if each post-project calendar day average deviates no more than 20% from the corresponding pre-project value.

Use the following algorithm for determining compliance with Criterion 2 (variance in average monthly influent volume).

1. Calculate the monthly runoff volume for each calendar month (e.g., April) in the precipitation record for both pre-project and post-project conditions. Volumes shall be calculated at the inflow to the wetland or the upslope edge where surface runoff, interflow, and ground water enter.

2. For each calendar month, calculate the multi-year average of the monthly runoff volume values for both pre-project and post-project conditions. This calculation will yield two values (pre-project and post-project) for each calendar month.

3. For each calendar month average, compare the pre-project and post-project values. The criterion is satisfied if each post-project calendar month average deviates no more than 15% from the corresponding pre-project value.

D. WWHM Modeling Information and Instructions

Assume the flow components feeding the wetland under pre-project and post-project scenarios are the sum of the surface, interflow, and ground water flows from the project site. Assign the wetland a point of compliance #1 (POC) number such as POC1 downstream of the project area.

For the pre-project scenario, connect all flow components to the wetland/POC1

➢ **Pre-project Total Flows to POC1 = Surface + Interflow + Ground water**

• Post-project scenario - Identify flows to the wetland/POC1.

a) Impervious surfaces send flows to wetland via (1) - surface flow.

✓ WWHM sub-flows to POC1 = Surface flow (+ Interflow default set in WWHM)

b) Pervious surfaces send flows to wetland via (1) - surface, (2) - interflow, and (3) - ground.

✓ WWHM sub-flows to POC1 = Surface + Interflow + Ground water

c) Infiltrating facilities send flows to wetland via ground water, and surface overflows.

(1) Ground water - Connect infiltrated water (Outlet 2) to ground water component of the area between facility and wetland. Use Lateral Basin downstream of the infiltrating facility and connect Outlet 2 to the ground water component of the Lateral Basin. If this area is the same area modeled in Step (b) above, use the Lateral Basin element in Step (b).

✓ WWHM sub-flows to POC1 = infiltrated flows

(2) Surface Overflow – Connect the surface flow (Outlet 1) to wetland/POC1

✓ WWHM sub-flows to POC1 = facility surface flows (Outlet 1)

➢ **Post-project Total Flows to POC1 = Sum of flows in (a), (b), and (c).**

The following strategies may reduce the volume of surface flows if the limits stated above are exceeded:

• Reducing of the level of development by reducing the amount of impervious surface and/or increasing the retention of natural forest cover.

• Increasing infiltration through the use of LID BMPs.

• Increasing storage capacity for surface runoff.

• Using selective runoff bypass around the wetland. Bypassed flow must still comply with other applicable stormwater requirements.

E. Additional Guidance Information

The following information may be useful but is not explicitly required by Snohomish County code.

- Retain areas of native vegetation connecting the wetland and its buffers with nearby wetlands and other areas of contiguous vegetation
- Retain shrub or woody debris as nesting sites for ground-nesting birds and downed logs and stumps for winter wren habitat.
- Retain snags as habitat for cavity-nesting bird species.
- Retain shrubs in and around the wetland for protective cover. If cover is insufficient to protect against domestic pet predation, consider planting native bushes such as rose species in the buffer.
- Avoid compaction of soil and introduction of exotic or invasive plants during work in a wetland.
- If human entry is desired, establish paths that permit people to observe the wetland with minimum disturbance to the birds.

See the 2014 Ecology Stormwater Management Manual for Western Washington Volume I Appendix I-D for information about native and recommended wetland plant species.

Appendix I-E
Surface Waters Exempt From Flow Control Requirements

Stormwater discharges subject to the flow control requirements of Minimum Requirement 7 per SCC 30.63A.550 are exempt from these requirements if they are discharged to the following water bodies, provided that the discharges meet the conditions set forth in this appendix.

Snohomish County Surface Waters Exempt From Flow Control Requirements

Water Body	Upstream Point/Reach for Exemption (if applicable)
All salt water bodies	N/A
Sauk River	Downstream of confluence of South Fork and North Fork
Sauk River, North Fork	North Fork Sauk River at Bedal Campground
Skykomish River	Downstream of South Fork
Skykomish River, South Fork	Downstream of confluence of Tye and Foss Rivers
Snohomish River	Downstream of confluence of Snoqualmie and Skykomish Rivers
Snoqualmie River	Downstream of confluence of the Middle Fork
Snoqualmie River, Middle Fork	Downstream of confluence with Rainy Creek
Stillaguamish River	Downstream of confluence of North and South Fork
Stillaguamish River, North Fork	7.7 highway miles west of Darrington on SR530, downstream of confluence with French Creek.
Stillaguamish River, South Fork	7 Downstream of confluence of Cranberry Creek and South Fork
Suiattle River	Downstream of confluence with Milk Creek
Sultan River	0.4 miles upstream of SR2

Conditions for exemption

All of the following conditions must be met for discharges to be exempt from Minimum Requirement 7:

- Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types “S”, “F”, or “Np” in the Permanent Water Typing System, or from any category I, II, or III wetland.
- Flow splitting devices or drainage BMP’s are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland as follows:
  - Design of flow splitting devices or drainage BMP’s will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.
  - Flow splitting devices or drainage BMP’s that deliver flow to category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland

hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction.

- The project site must be drained by a conveyance system that is composed entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection) and extends to the ordinary high water line of the exempt receiving water.
- The conveyance system between the project site and the exempt receiving water shall have a hydraulic capacity sufficient to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected.
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.

Appendix I-F
Stormwater Pollution Prevention Plan (SWPPP) Submittal Requirements for Small Projects Pursuant to SCC 30.63A.810

Introduction

This appendix provides requirements for selecting best management practices (BMPs) for Stormwater Pollution Prevention Plans (SWPPPs) for small projects that meet the criteria set forth in SCC 30.63A.810. If required, applicants shall use the small project SWPPP drainage review forms provided by Snohomish County Department of Planning and Development Services.

These projects are required to comply with Minimum Requirement 2 - Stormwater Pollution Prevention, and a key criterion of these projects is that they do not require the stamp of a licensed civil engineer. Consequently, the applicant must be able to meet these requirements by using the erosion control BMPs listed in this appendix. The BMPs listed in this appendix do not require an engineer's stamp.

Note that SWPPP element 13 requires protection of BMPs required to meet Minimum Requirement 5. Projects meeting the criteria of SCC 30.63A.810 are by definition those to which only Minimum Requirement 2 applies, so SWPPP element 13 is not discussed below.

The following sections contain a review of the twelve applicable elements of Minimum Requirement 2 and the erosion control BMPs allowable for small projects to meet these requirements, and the required sequence of BMP implementation

Applicable elements of Minimum Requirement 2 and allowable erosion control BMPs

The elements of Minimum Requirement 2 applicable to small projects as defined in SCC 30.63A.810 are:

1. Mark clearing limits
2. Establish construction access
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering
11. Maintain BMPs

12. Manage the project

The measures used to meet these twelve elements must be described or shown in drawing form in the Stormwater Pollution Prevention Plan (SWPPP). For details on how these elements are implemented on larger projects, see SCC 30.63A.450 and Volume II, Chapter 3.

SWPPP element 1: preserve vegetation/mark clearing limits

Minimize removal of existing trees and disturbance and compaction of native soils, except as needed for building purposes. The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum degree practicable. Plan and implement proper clearing and grading of the site. Clear only the areas needed, thus keeping exposed areas to a minimum. Phase clearing so that only those areas that are actively being worked are uncovered. Soil shall be managed in a manner that does not permanently compact or deteriorate the final soil and landscape system. If disturbance and/or compaction occur the impact must be corrected at the end of the construction activity. This shall include restoration of soil depth, soil quality, permeability, and percent organic matter. Construction practices must not cause damage to or compromise the design of permanent landscape or infiltration areas.

Prior to beginning land disturbing activities, delineate or mark the following areas and features on the site:

(a) Clearing limits;

(b) All critical areas, and their setbacks and buffers;

(c) Erosion or landslide hazard areas and their setbacks and buffers;

(d) Existing and proposed easements;

(e) Required landscaping, and tree retention and replacement areas;

(f) Other areas on the site required to be preserved or protected including, but not limited to, drainage courses.

Relevant BMPs:

- BMP C101: Preserving Natural Vegetation
- BMP C102: Buffer Zones
- BMP C103: High Visibility Plastic or Metal Fence

SWPPP element 2: establish construction access

Construction vehicle ingress and egress shall be limited to one route if possible. A stabilized construction entrance or other equivalent BMP shall be installed to prevent sediment transport onto roads.

Streets shall be cleaned at the end of each day during dry weather and more frequently during wet weather. Street washing is only allowed after sediment is removed by shoveling or pick-up sweeping and transported to a controlled disposal area. Street wash wastewater shall be controlled by pumping it back on site or otherwise preventing its discharge into systems tributary to the waters of the state or waters that would otherwise require enhanced treatment.

Relevant BMPs:

- BMP C105: Stabilized Construction Entrance
- BMP C107: Construction Road/Parking Area Stabilization

SWPPP element 3: control flow rates

Small projects shall meet this requirement by appropriate use of BMPs related to SWPPP element 4.

SWPPP element 4: install sediment controls

Remove sediment from construction site runoff by using appropriate sediment removal BMPs. Runoff from fully stabilized areas may be discharged without a sediment removal BMP.

Relevant BMPs:

- BMP C231: Brush Barrier
- BMP C232: Gravel Filter Berm
- BMP C233: Silt Fence
- BMP C234: Vegetated Strip
- BMP C235: Wattles

SWPPP element 5: stabilize soils

Exposed and unworked soils and soil stockpiles shall be stabilized. Soil stockpiles shall be located away from storm drain inlets, drainage channels and other waters.

The time period of soil exposure allowed depends on the season. No soils shall remain exposed and unworked for more than seven days during the dry season, May 1 through September 30, or two days during the wet season, October 1 through April 30, unless the ~~County~~county places other restrictions on the project.

Locate excavated basement soil a reasonable distance behind the curb, such as in the backyard or side yard area. This will increase the distance eroded soil must travel to reach the storm sewer system. Soil piles should be covered until the soil is either used or removed. Piles should be situated so that sediment does not run into the street or adjoining yards. Backfill basement walls as soon as possible and rough grade the lot. This will eliminate large soil mounds, which are highly erodible, and prepares the lot for temporary cover, which will further reduce erosion potential

Remove excess soil from the site as soon as possible after backfilling. This will eliminate any sediment loss from surplus fill.

If a lot has a soil bank higher than the curb, a trench or berm should be installed moving the bank several feet behind the curb. This will reduce the occurrence of gully and rill erosion while providing a storage and settling area for stormwater.

Relevant BMPs:

- BMP C120: Temporary and Permanent Seeding. - *NOTE: Ssmall projects shall only use methods in BMP C120 that do not require engineering.*
- BMP C121: Mulching
- BMP C122: Blankets. - *NOTE: Ssmall projects shall only use methods in BMP C122 that do not require engineering.*
- BMP C123: Plastic Covering. - *NOTE: sSmall projects shall only use methods in BMP C123 that do not require engineering.*
- BMP C124: Sodding
- BMP C125: Topsoiling / Composting
- BMP C140: Dust Control

SWPPP Element 6: protect slopes

NOTE: Cut and fill slopes may require engineering, pursuant to SCC 30.63B.110, SCC 30.63B.130, SCC 30.63B.200. In addition, most of the BMPs related to this SWPPP element require engineering. If cut or fill slopes are proposed, the applicant should verify that the project meets the small project criteria.

Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion and comply with the Countycounty's critical area regulations. Cut and fill slopes shall be protected from erosive flows and concentrated flows until permanent cover and drainage conveyance systems are in place. Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.

Relevant BMPs:

- BMP C120: Temporary and Permanent Seeding. *NOTE: Ssmall projects shall only use methods in BMP C120 that do not require engineering.*
- BMP C208: Triangular Silt Dike. - *NOTE: Ssmall projects shall only use methods in BMP C208 that do not require engineering.*

SWPPP element 7: protect permanent drain inlets.

All permanent storm drain inlets require protection from sediment and silt-laden water. Permanent storm drain inlets operable on the site during construction shall be protected so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment. Inlet protection devices shall be cleaned or removed and replaced when sediment has filled one-third of the available storage or as specified by the product manufacturer. They may be removed once the site is stabilized.

Relevant BMPs:

- BMP C220: Storm Drain Inlet Protection

SWPPP element 8: stabilize channels and outlets

NOTE: ~~-~~Design and construction of stormwater conveyance systems requires an engineer per SCC 30.63A.400(3)(d). In addition, the BMPs related to this SWPPP element require engineering. The channel and outlet stabilization measures proposed herein are intended for protection of preexisting drainage systems on the project site, and the project applicant should verify with the ~~County~~county that the project meets the small project criteria.

Temporary and permanent conveyance systems shall be stabilized to prevent erosion during and after construction. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches shall be provided at the outlets of all conveyance systems.

Relevant BMPs:

- BMP C202: Channel Lining.~~-~~ *NOTE: S~~s~~mall projects shall only use methods in BMP C202 that do not require engineering.*
- BMP C209: Outlet Protection.~~-~~ *NOTE: S~~s~~mall projects shall only use methods in BMP C209 that do not require engineering.*

SWPPP element 9: control pollutants

Appropriate pollution source control measures shall be implemented in areas of: construction equipment maintenance or fueling; handling or storage of waste materials, construction debris, fertilizers, chemicals; and other activities that may contribute pollutants to stormwater. The following specific requirements apply:

- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment.
- On-site fueling tanks shall include secondary containment.
- Maintenance, fueling and repair of heavy equipment and vehicles shall be conducted using spill prevention and control measures consistent with Volume IV, Chapters 2 and 3.
- Contaminated surfaces shall be cleaned immediately following any spill incident.
- Application of fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' label requirements for application rates and procedures shall be followed
- BMPs shall be used to prevent contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing approved treatment, curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters.

Relevant BMPs:

- BMP C151: Concrete Handling. ~~-~~*NOTE: S~~s~~mall projects shall only use methods in BMP C151 that do not require engineering*

- BMP C152: Sawcutting and Surfacing Pollution Prevention
- BMP C 153: Material Storage, Delivery, and Containment

See also Volume IV of this manual

SWWP element 10: control dewatering

NOTE: Many of the BMPs related to this SWPPP element require engineering; however most small projects stormwater runoff will be dispersed on site to natural vegetation, to a containment vessel or sewer system with permission of the utility company. In these cases, this BMP may not be applicable. The project applicant should verify with the ~~County~~county that the project meets the small project criteria.

Turbid or contaminated dewatering water shall be handled separately from stormwater, and shall be collected for off-site disposal in a legal manner, or discharged to a sanitary sewer contingent on local sewer district approval. Uncontaminated or clean water from dewatering systems for trenches, vaults and foundations may be disposed by on-site infiltration or use of a catch basin insert or with outfall to a ditch or swale for small volumes of dewatering water.

Relevant BMPs

- BMP C220 - Storm Drain Inlet Protection

SWPPP element 11: maintain best management practices.

BMPs shall be inspected and maintained during construction and removed within 30 days after the ~~County~~county determines that the site is stabilized, provided that temporary BMPs may be removed when they are no longer needed.

SWPPP element 12: manage the project.

The SWPPP shall be fully implemented at all times and modified whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to waters of the state.

Sequence of BMP Implementation

1) Delineate or mark the following areas and features on the site:
   - (a) Clearing limits;
   - (b) Critical areas and their buffers;
   - (c) Erosion or landslide hazard areas and their setbacks;
   - (d) Easements;
   - (e) Required landscaping, and tree retention and replacement areas;
   - (f) Other areas on the site required to be preserved or protected including, but not limited to, drainage courses.
2) Install stabilized construction entrance and parking area stabilization.
3) Protect existing drainage systems on site.

4) Establish areas for storage and handling of polluted materials at which pollution source control BMPs will be implemented.

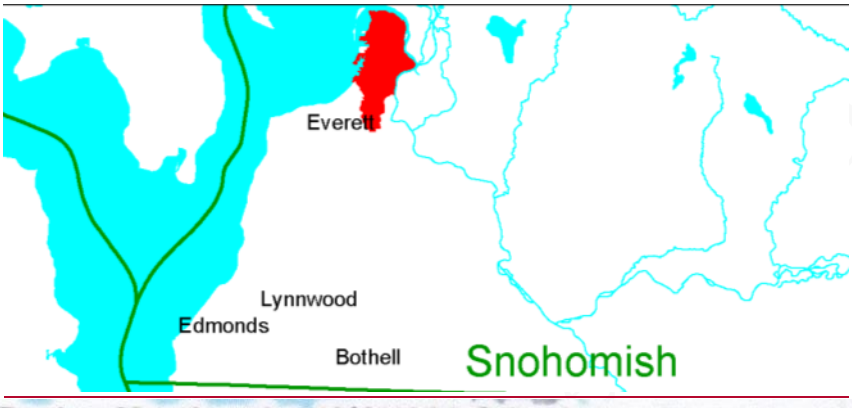
5) Install sediment controls.

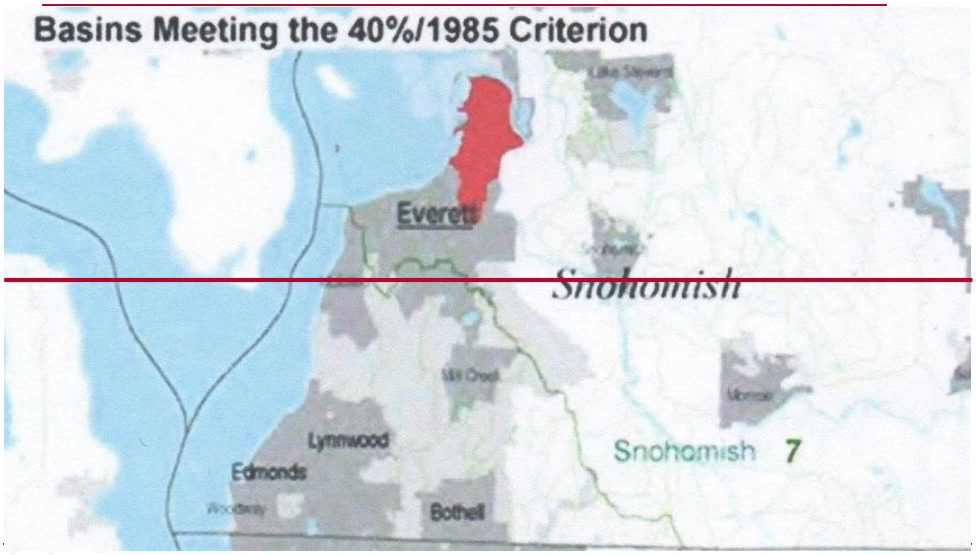
6) Implement stabilization measures for disturbed areas, slopes, and material stockpiles.

7) Maintain BMPs until final site stabilization.

Appendix I-G
Area of Snohomish County with 40% or more impervious area as of 1985

Source: 20149 Ecology Stormwater Management Manual for Western Washington





Glossary and Notations

The following terms are provided for reference and use with this manual. They shall be superseded by any other definitions for these terms adopted by Snohomish County Code or Snohomish County EDDS.

AASHTO classification — The official classification of soil materials and soil aggregate mixtures for highway construction, used by the American Association of State Highway and Transportation Officials.

Absorption — The penetration of a substance into or through another, such as the dissolving of a soluble gas in a liquid.

Adjacent steep slope — A slope with a gradient of 15 ~~percent~~% or steeper within five hundred feet of the site.

Adsorption — The adhesion of a substance to the surface of a solid or liquid; often used to extract pollutants by causing them to be attached to such adsorbents as activated carbon or silica gel. Hydrophobic, or water-repulsing adsorbents, are used to extract oil from waterways when oil spills occur. Heavy metals such as zinc and lead often adsorb onto sediment particles.

Aeration — The process of being supplied or impregnated with air. In waste treatment, the process used to foster biological and chemical purification. In soils, the process by which air in the soil is replenished by air from the atmosphere. In a well aerated soil, the soil air is similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide and a correspondingly lower percentage of oxygen.

Aerobic — Living or active only in the presence of free (dissolved or molecular) oxygen.

Aerobic bacteria — Bacteria that require the presence of free oxygen for their metabolic processes.

Aggressive plant species — Opportunistic species of inferior biological value that tend to out-compete more desirable forms and become dominant; applied to native species in this manual.

Algae	Primitive plants, many microscopic, containing chlorophyll and forming the base of the food chain in aquatic environments. Some species may create a nuisance when environmental conditions are suitable for prolific growth.
Algal bloom	Proliferation of living algae on the surface of lakes, streams or ponds; often stimulated by phosphate over-enrichment. Algal blooms reduce the oxygen available to other aquatic organisms.
American public works association (APWA)	The Washington State Chapter of the American Public Works Association.
Anadromous	Fish that grow to maturity in the ocean and return to rivers for spawning.
Anaerobic	Living or active in the absence of oxygen.
Anaerobic bacteria	Bacteria that do not require the presence of free or dissolved oxygen for metabolism.
Annual flood	The highest peak discharge on average which can be expected in any given year.
Antecedent moisture conditions	The degree of wetness of a watershed or within the soil at the beginning of a storm.
Anti-seep collar	A device constructed around a pipe or other conduit and placed through a dam, levee, or dike for the purpose of reducing seepage losses and piping failures.
Anti-vortex device	A facility placed at the entrance to a pipe conduit structure such as a drop inlet spillway or hood inlet spillway to prevent air from entering the structure when the pipe is flowing full.
Applicant	The person who has applied for a development permit or approval.
Approved continuous runoff hydrologic model	The continuous runoff hydrologic models ~~Software~~ identified in Volume III, Chapter 2.1 ~~of this manual used to simulate stormwater runoff hydrology~~.
Appurtenances	Machinery, appliances, or auxiliary structures attached to a main structure, but not considered an integral part thereof, for the purpose of enabling it to function.

Aquifer	A geologic stratum containing ground water that can be withdrawn and used for human purposes.
Arterial	A transportation facility designated as an arterial in an UGA plan or the comprehensive plan.
As-built drawings	Engineering plans which have been revised to reflect all changes to the plans which occurred during construction.
As-graded	The extent of surface conditions on completion of grading.
BSBL	See Building set back line.
Background	A description of pollutant levels arising from natural sources, and not because of man's immediate activities.
Background water quality	See Chapter 30.91B.010 SCC. "Background water quality" means the concentrations of chemical, physical, biological, or radiological constituents, or other characteristics in or of groundwater at a particular point in time and upgradient of an activity that have not been affected by that activity.
Backwater	Water upstream from an obstruction which is deeper than it would normally be without the obstruction.
Baffle	A device to check, deflect, or regulate flow.
Bankfull discharge	A flow condition where streamflow completely fills the stream channel up to the top of the bank. In undisturbed watersheds, the discharge conditions occur on average every 1.5 to 2 years and controls the shape and form of natural channels.
Base flood	See SCC 30.91B.020.The flood having a one percent chance of being equaled or exceeded in any given year.
Base flood elevation	The water surface elevation of the base flood. It shall be referenced to the National Geodetic Vertical Datum of 1929 (NGVD).
Baseline sample	A sample collected during dry-weather flow (i.e., it does not consist of runoff from a specific precipitation event).

Basin plan

A plan that assesses, evaluates, and proposes solutions to existing and potential future impacts to the beneficial uses of, and the physical, chemical, and biological properties of waters of the state within a basin. Basins typically range in size from 1 to 50 square miles. A plan should include but not be limited to recommendations for:

- Stormwater requirements for new development and redevelopment;
- Capital improvement projects;
- Land Use management through identification and protection of critical areas, comprehensive land use and transportation plans, zoning regulations, site development standards, and conservation areas;
- Source control activities including public education and involvement, and business programs;
- Other targeted stormwater programs and activities, such as maintenance, inspections and enforcement;
- Monitoring; and
- An implementation schedule and funding strategy.

A plan that is "adopted and implemented" must have the following characteristics:

- It must be adopted by legislative or regulatory action of jurisdictions with responsibilities under the plan;
- Ordinances, regulations, programs, and procedures recommended by the plan should be in effect or on schedule to be in effect; and,
- An implementation schedule and funding strategy that are in progress.

Bearing capacity

The maximum load that a material can support before failing.

Bedrock

The more or less solid rock in place either on or beneath the surface of the earth. It may be soft, medium, or hard and have a smooth or irregular surface.

Bench

A relatively level step excavated into earth material on which fill is to be placed.

Berm

A constructed barrier of compacted earth, rock, or gravel. In a stormwater facility, a berm may serve as a vertical divider typically built up from the bottom.

Best management practices (BMPs)	See SCC 30.91B.080. The schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington ~~S~~state.
Biochemical oxygen demand (BOD)	An indirect measure of the concentration of biologically degradable materials present in organic wastes. The amount of free oxygen utilized by aerobic organisms when allowed to attack the organic material in an aerobically maintained environment at a specified temperature (20°C) for a specific time period (5 days), and thus stated as BOD5. It is expressed in milligrams of oxygen utilized per liter of liquid waste volume (mg/l) or in milligrams of oxygen per kilogram of waste solution (mg/kg = ppm = parts per million parts). Also called biological oxygen demand.
Biodegradable	Capable of being readily broken down by biological means, especially by microbial action. Microbial action includes the combined effect of bacteria, fungus, flagellates, amoebae, ciliates, and nematodes. Degradation can be rapid or may take many years depending upon such factors as available oxygen and moisture.
Bioengineering	The combination of biological, mechanical, and ecological concepts (and methods) to control erosion and stabilize soil through the use of vegetation or in combination with construction materials.
Biofilter	A designed treatment facility using a combined soil and vegetation system for filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater when runoff flows over and through. Vegetation growing in these facilities acts as both a physical filter which causes gravity settling of particulates by regulating velocity of flow, and also as a biological sink when direct uptake of dissolved pollutants occurs. The former mechanism is probably the most important in western Washington where the period of major runoff coincides with the period of lowest biological activity.
Biofiltration	See SCC 30.91B.130.The process of reducing pollutant concentrations in water by filtering through biological materials.
Biological control	A method of controlling pest organisms by means of introduced or naturally occurring predatory organisms, sterilization, the use of inhibiting hormones, or other means, rather than by mechanical or chemical means.

Biological magnification	The increasing concentration of a substance along succeeding steps in a food chain. Also called biomagnification.
Biosolids	Municipal sewage sludge that is a primarily organic, semisolid product resulting from the wastewater treatment process, that can be beneficially recycled and meets all applicable requirements under Chapter 173-308 WAC. Biosolids includes a material derived from biosolids, and septic tank sludge, also known as septage, that can be beneficially recycled and meets all applicable requirements under Chapter 173-308 WAC. For the purposes of Chapter 173-308 WAC, semisolid products include biosolids or products derived from biosolids ranging in character from mostly liquid to fully dried solids.
Bollard	See SCC 30.91B.175. A rigid post, permanent or removable, used as a traffic control device to limit vehicle access. Bollards are usually installed in a line with sufficient space between them to allow permitted access, such as bicycles and pedestrians, but not motor vehicles. Removable bollards are used when access may be required for special-purpose vehicles but not general traffic.
Bond	A surety bond, cash deposit or escrow account, assignment of savings, irrevocable letter of credit or other means acceptable to or required by the manager to guarantee that work is completed in compliance with the project's drainage plan and in compliance with all local government requirements.
Borrow area	A source of earth fill material used in the construction of embankments or other earth fill structures.
Buffer	The zone contiguous with a critical area that is required for the continued maintenance, function, and structural stability of the critical area. The critical functions of a riparian buffer (those associated with an aquatic system) include shading, input of organic debris and coarse sediments, uptake of nutrients, stabilization of banks, interception of fine sediments, overflow during high water events, protection from disturbance by humans and domestic animals, maintenance of wildlife habitat, and room for variation of aquatic system boundaries over time due to hydrologic or climatic effects. The critical functions of terrestrial buffers include protection of slope stability, attenuation of surface water flows from stormwater runoff and precipitation, and erosion control.
CIP	See Capital Improvement Project.

Capital improvement project or program (CIP)	A project prioritized and scheduled as a part of an overall construction program or, the actual construction program.
Catch basin	A chamber or well, usually built at the curb line of a street, for the admission of surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.
Catchline	The point where a severe slope intercepts a different, more gentle slope.
Catchment	Surface drainage area.
Cation exchange capacity (CEC)	The amount of exchangeable cations that a soil can absorb at pH 7.0.
Certified erosion and sediment control lead (CESCL)	An individual who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by the Department of Ecology (see BMP C160 in the Drainage Manual). A CESCL is knowledgeable in the principles and practices of erosion and sediment control. The CESCL must have the skills to assess site conditions and construction activities that could impact the quality of stormwater and, the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
Channel	A feature that conveys surface water and is open to the air.
Channel, constructed	Channels or ditches constructed (or reconstructed natural channels) to convey surface water.
Channel, natural	Streams, creeks, or swales that convey surface/ground water and have existed long enough to establish a stable route and/or biological community.
Channel stabilization	Erosion prevention and stabilization of velocity distribution in a channel using vegetation, jetties, drops, revetments, and/or other measures.
Channel storage	Water temporarily stored in channels while enroute to an outlet.

Channelization	Alteration of a stream channel by widening, deepening, straightening, cleaning, or paving certain areas to change flow characteristics.
Check dam	Small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment
Chemical oxygen demand (COD)	A measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water. The COD test, like the BOD test, is used to determine the degree of pollution in water.
Civil engineer	See SCC 30.91C.090. A professional engineer licensed by the state of Washington to practice in the field of civil engineering.
Civil engineering	See SCC 30.91C.100.The application of the knowledge of the forces of nature, principles of mechanics and the properties of materials to the evaluation, design and construction of civil works.
Clay lens	A naturally occurring, localized area of clay which acts as an impermeable layer to runoff infiltration.
Clearing	See SCC 30.91C.112. The destruction or surface removal of vegetation by cutting, pruning, limbing, topping, relocating manually or mechanically, application of herbicides or pesticides or other chemical methods, or any application of hazardous or toxic substance that has the effect of destroying or removing the vegetation.
Closed depression	An area which is low-lying and either has no, or such a limited, surface water outlet that during storm events the area acts as a retention basin.
Cohesion	The capacity of a soil to resist shearing stress, exclusive of functional resistance.
Coliform bacteria	Microorganisms common in the intestinal tracts of man and other warm-blooded animals; all the aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. Used as an indicator of bacterial pollution.
Common plan of development or sale	A site where multiple separate and distinct construction activities may be taking place at different times on different schedules and/or by different contractors, but still under a single plan. Examples include: 1) phase projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., a development where lots are sold

	to separate builders); 2) a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility; and 4) linear projects such as roads, pipelines, or utilities. If the project is part of a common plan of development or sale, the disturbed area of the entire plan must be used in determine permit requirements.
Compaction	The densification, settlement, or packing of soil in such a way that permeability of the soil is reduced. Compaction effectively shifts the performance of a hydrologic group to a lower permeability hydrologic group. For example, a group B hydrologic soil can be compacted and be effectively converted to a group C hydrologic soil in the way it performs in regard to runoff. Compaction may also refer to the densification of a fill by mechanical means.
Compensatory storage	New excavated storage volume equivalent to the flood storage capacity eliminated by filling or grading within the flood fringe. Equivalent shall mean that the storage removed shall be replaced by equal volume between corresponding one-foot contour intervals that are hydraulically connected to the floodway through their entire depth.
Compost	Organic material that has undergone biological degradation and transformation under controlled conditions designed to promote aerobic decomposition at a solid waste facility in compliance with the requirements of Chapter 173-350 WAC, or biosolids composted in compliance with Chapter 173-308 WAC. Composting is a form of organic material recycling. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.
Comprehensive planning	Planning that takes into account all aspects of water, air, and land resources and their uses and limits.
Conservation district	A public organization created under state enabling law as a special-purpose district to develop and carry out a program of soil, water, and related resource conservation, use, and development within its boundaries, usually a subdivision of state government with a local governing body and always with limited authority. Often called a soil conservation district or a soil and water conservation district.
Constructed wetland	Those wetlands intentionally created on sites that are not wetlands for the primary purpose of wastewater or stormwater treatment and

	managed as such. Constructed wetlands are normally considered as part of the stormwater collection and treatment system.
Construction stormwater pollution prevention plan	A document that describes the potential for pollution problems on a construction project and explains and illustrates the measures to be taken on the construction site to control those problems.
Contour	An imaginary line on the surface of the earth connecting points of the same elevation.
Converted vegetation areas	The surfaces on a project site where native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation (e.g., Himalayan blackberry, scotch broom) are converted to lawn or landscaped areas, or where native vegetation is converted to pasture.
Conveyance	A mechanism for transporting water from one point to another, including pipes, ditches, and channels.
Conveyance system	See SCC 30.91C.300. A system of drainage facilities, natural, or artificial which collects, contains and conducts the flow of storm water runoff. The elements of a natural conveyance system include, but are not limited to, swales, wetlands, drainage courses, streams, and rivers. The elements of an artificial conveyance system include, but are not limited to, gutters, ditches, pipes, constructed open channels and detention facilities.
Cover crop	A close-growing crop grown primarily for the purpose of protecting and improving soil between periods of permanent vegetation.
Created wetland	Means those wetlands intentionally created from nonwetland sites to produce or replace natural wetland habitat (e.g., compensatory mitigation projects).
Critical area	See SCC 30.91C.340. Critical area means the following areas: (1) Wetlands; (2) Areas with a critical recharging effect on aquifers used for potable water, including: (a) Sole source aquifers, (b) Group A well head protection areas, and (c) Critical aquifer recharge areas; (3) Fish and wildlife habitat conservation areas, including:

(a) Streams,

(b) Lakes,

(c) Marine waters, and

(d) Primary association areas for critical species;

(4) Frequently flooded areas; and

(5) Geologically hazardous areas, including:

(a) Erosion hazard areas,

(b) Landslide hazard areas,

(c) Seismic hazard areas,

(d) Mine hazard areas,

(e) Volcanic hazard areas, and

(f) Tsunami hazard areas.

Critical drainage area — An area with such severe flooding, drainage and/or erosion/sedimentation conditions that the area has been formally adopted as a Critical Drainage Area by rule under the procedures specified in an ordinance.

Critical reach — The point in a receiving stream below a discharge point at which the lowest dissolved oxygen level is reached and stream recovery begins.

Culvert — Pipe or concrete box structure that drains open channels, swales or ditches under a roadway or embankment. Typically with no catch basins or manholes along its length.

Cut — Portion of land surface or area from which earth has been removed or will be removed by excavating; the depth below original ground surface to excavated surface.

Cut-and-fill — Process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

Cut slope — A slope formed by excavating overlying material to connect the original ground surface with a lower ground surface created by the excavation. A cut slope is distinguished from a bermed slope, which is constructed by importing soil to create the slope.

DNS — See Determination of Nonsignificance.

Dead storage — The volume available in a depression in the ground below any conveyance system, or surface drainage pathway, or outlet invert elevation that could allow the discharge of surface and stormwater runoff.

Dedication of land	Refers to setting aside a portion of a property for a specific use or function.
Degradation	(Biological or chemical) The breakdown of complex organic or other chemical compounds into simpler substances, usually less harmful than the original compound, as with the degradation of a persistent pesticide. (Geological) Wearing down by erosion. (Water) The lowering of the water quality of a watercourse by an increase in the pollutant loading.
Degraded (disturbed) wetland (community)	A wetland (community) in which the vegetation, soils, and/or hydrology have been adversely altered, resulting in lost or reduced functions and values; generally, implies topographic isolation; hydrologic alterations such as hydroperiod alteration (increased or decreased quantity of water), diking, channelization, and/or outlet modification; soils alterations such as presence of fill, soil removal, and/or compaction; accumulation of toxicants in the biotic or abiotic components of the wetland; and/or low plant species richness with dominance by invasive weedy species.
Denitrification	The biochemical reduction of nitrates or nitrites in the soil or organic deposits to ammonia or free nitrogen.
Depression storage	The amount of precipitation that is trapped in depressions on the surface of the ground.
Design engineer	The professional civil engineer licensed in the ~~State~~state of Washington who prepares the analysis, design, and engineering plans for an applicant's permit or approval submittal.
Design storm	See SCC 30.91D.160. A rainfall event of a size approved by the director, used for the purpose of sizing and designing drainage facilities, stated in terms of a recurrence interval and a time period over which the rainfall amount is measured or analyzed (i.e., a 2-year, 24-hour storm).
Detention	See SCC 30.91D.170.The temporary storage of storm water runoff to control peak discharge rates and allow settling of storm water sediment.
Detention facility	See SCC 30.91D.180. An open or closed drainage facility, such as a pond or tank, that temporarily stores storm water runoff and releases it at a slower rate than it is collected by the drainage facility. The facility includes the flow control structure, the inlet and outlet pipes, and all maintenance access points.

Detention time	The theoretical time required to displace the contents of a stormwater treatment facility at a given rate of discharge (volume divided by rate of discharge).
Determination of nonsignificance	See SCC 30.91D.300.The written decision by the responsible official of the lead agency that a proposal is not likely to have a significant adverse environmental impact, and therefore an EIS is not required. See WAC 197-11-734.
Development	Means new development, redevelopment, or both. See definitions for each.
Discharge	See SCC 30.91D.287.Runoff leaving a new development or redevelopment via overland flow, built conveyance systems, or infiltration facilities. A hydraulic rate of flow, specifically fluid flow; a volume of fluid passing a point per unit of time, commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, gallons per day, or millions of gallons per day.
Dispersion	Release of surface and stormwater runoff from a drainage facility system such that the flow spreads over a wide area and is located so as not to allow flow to concentrate anywhere upstream of a drainage channel with erodible underlying granular soils.
Ditch	A long narrow excavation dug in the earth for drainage with its top width less than 10 feet at design flow.
Divide, drainage	The boundary between one drainage basin and another.
Drain	A buried pipe or other conduit (closed drain). A ditch (open drain) for carrying off surplus surface water or ground water.
(To) Drain	To provide channels, such as open ditches or closed drains, so that excess water can be removed by surface flow or by internal flow. To lose water (from the soil) by percolation.
Drainage	See SCC 30.91D.350. The collection, conveyance, containment, or discharge of storm water runoff
Drainage basin	See SCC 30.91D.360. A geographic and hydrologic area of a watershed or drainage catchment area.
Drainage channel	A drainage pathway with a well-defined bed and banks indicating frequent conveyance of surface and stormwater runoff.
Drainage course	A pathway for watershed drainage characterized by wet soil vegetation; often intermittent in flow.

Drainage easement A legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the drainage facilities contained within the boundaries of the easement.

Drainage facility See SCC 30.91D.370. A system of collecting, conveying and storing storm water runoff. Drainage facilities include, but are not limited to, all storm water conveyance systems and containment facilities including pipelines, channels, dikes, ditches, closed depressions, infiltration facilities, retention facilities, detention facilities, storm water treatment facilities, erosion and sedimentation control facilities, and other drainage structures and appurtenances, both natural and artificial.

Drainage impacts See SCC 30.91D.380. The adverse impacts from changes to existing water quantity, rate or quality; water storage, retention and detention capacity, or water conveyance ability caused by a development activity; and may include, but are not limited to, flooding, erosion, sedimentation, scouring, bank sloughing, groundwater discharges to aquifer recharge areas, and adverse impacts to wetlands, fish and wildlife habitat conservation areas and geologically hazardous areas.

Drainage pathway The route that surface and stormwater runoff follows downslope as it leaves any part of the site.

Drainage review An evaluation by Plan Approving Authority staff of a proposed project's compliance with the drainage requirements in this manual or its technical equivalent.

Drainage, soil As a natural condition of the soil, soil drainage refers to the frequency and duration of periods when the soil is free of saturation; for example, in well-drained soils the water is removed readily but not rapidly; in poorly drained soils the root zone is waterlogged for long periods unless artificially drained, and the roots of ordinary crop plants cannot get enough oxygen; in excessively drained soils the water is removed so completely that most crop plants suffer from lack of water. Strictly speaking, excessively drained soils are a result of excessive runoff due to steep slopes or low available water-holding capacity due to small amounts of silt and clay in the soil material. The following classes are used to express soil drainage:

Well drained - Excess water drains away rapidly and no mottling occurs within 36 inches of the surface.

- Moderately well drained - Water is removed from the soil somewhat slowly, resulting in small but significant periods of wetness. Mottling occurs between 18 and 36 inches.

- Somewhat poorly drained - Water is removed from the soil slowly enough to keep it wet for significant periods but not all of the time. Mottling occurs between 8 and 18 inches.

- Poorly drained - Water is removed so slowly that the soil is wet for a large part of the time. Mottling occurs between 0 and 8 inches.

- Very poorly drained - Water is removed so slowly that the water table remains at or near the surface for the greater part of the time. There may also be periods of surface ponding. The soil has a black to gray surface layer with mottles up to the surface.

Drawdown Lowering of the water surface (in open channel flow), water table or piezometric surface (in ground water flow) resulting from a withdrawal of water.

Drop-inlet spillway Overall structure in which the water drops through a vertical riser connected to a discharge conduit.

Drop spillway Overall structure in which the water drops over a vertical wall onto an apron at a lower elevation.

Drop structure A structure for dropping water to a lower level and dissipating its surplus energy; a fall. A drop may be vertical or inclined.

Dry weather flow The combination of groundwater seepage and allowed non-stormwater flows found in storm sewers during dry weather.. Also that flow in streams during the dry season.

EIS See Environmental Impact Statement.

ESC Erosion and Sediment Control (Plan).

Earth material See SCC 30.91E.020. Any rock, natural soil or fill or any combination thereof.

Easement See SCC 30.91E.030. A right granted by a property owner to specifically named parties or to the public for the use of certain land for specified purposes. Where appropriate to the context, "easement" may also refer to the land covered by the grant. This may include access, pedestrian paths, bicycle paths, utility easements, drainage, native growth protection areas, resource protection areas, critical area protection areas, or open space.

Effective impervious surface	Those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces are considered ineffective if: (1) the runoff is dispersed through at least one hundred feet of native vegetation in accordance with BMP T5.30 – Full Dispersion in Volume V, Chapter 5 of this manual; (2) residential roof runoff is infiltrated in accordance with Downspout Full Infiltration Systems in BMP 5.10A Volume III, Chapter 3 of this manual; or (3) approved continuous runoff hydrologic modeling methods indicate that the entire runoff file is infiltrated.
Embankment	A structure of earth, gravel, or similar material raised to form a pond bank or foundation for a road.
Emergent plants	Aquatic plants that are rooted in the sediment but whose leaves are at or above the water surface. These wetland plants often have high habitat value for wildlife and waterfowl, and can aid in pollutant uptake.
Emergency spillway	A vegetated earth channel used to safely convey flood discharges in excess of the capacity of the principal spillway.
Emerging technology	Treatment technologies that have not been evaluated with approved protocols, but for which preliminary data indicate that they may provide a necessary function(s) in a stormwater treatment system. Emerging technologies need additional evaluation to define design criteria to achieve, or to contribute to achieving, state performance goals, and to define the limits of their use.
Energy dissipator	Any means by which the total energy of flowing water is reduced. In stormwater design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.
Energy gradient	The slope of the specific energy line (i.e., the sum of the potential and velocity heads).

Engineered soil/ landscape system

This is a self-sustaining soil and plant system that simultaneously supports plant growth, soil microbes, water infiltration, nutrient and pollutant adsorption, sediment and pollutant biofiltration, water interflow, and pollution decomposition. The system shall be protected from compaction and erosion. The system shall be planted and/or mulched as part of the installation.

The engineered soil/plant system shall have the following characteristics:

a. Be protected from compaction and erosion.

b. Have a plant system to support a sustained soil quality.

c. Possess permeability characteristics of not less than 6.0, 2.0, and 0.6 inches/hour for hydrologic soil groups A, B, and C, respectively (per ASTM D 3385). D is less than 0.6 inches/hour.

d. Possess minimum percent organic matter of 12, 14, 16, and 18 percent (dry-weight basis) for hydrologic soil groups A, B, C, and D, respectively (per ASTM D 2974).

Engineering geology

The application of geologic knowledge and principles in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.

Engineering plan

A plan prepared and stamped by a professional civil engineer.

Enhancement

To raise value, desirability, or attractiveness of an environment associated with surface water.

Environmental impact statement (EIS)

A document that discusses the likely significant adverse impacts of a proposal, ways to lessen the impacts, and alternatives to the proposal. They are required by the national and state environmental policy acts when projects are determined to have significant environmental impact.

Erodible granular soils

Soil materials that are easily eroded and transported by running water, typically fine or medium grained sand with minor gravel, silt, or clay content. Such soils are commonly described as Everett or Indianola series soil types in the SCS classification. Also included are any soils showing examples of existing severe stream channel incision as indicated by unvegetated streambanks standing over two feet high above the base of the channel.

Erosion	See SCC 30.91E.150. The removal and loss of soil by the action of water, ice, or wind.
Erosion classes (soil survey)	A grouping of erosion conditions based on the degree of erosion or on characteristic patterns. Applied to accelerated erosion, not to normal, natural, or geological erosion. Four erosion classes are recognized for water erosion and three for wind erosion.
Erosion and sedimentation control	Any temporary or permanent measures taken to reduce erosion; control siltation and sedimentation; and ensure that sediment-laden water does not leave the site.
Erosion and sediment control facility	A type of drainage facility designed to hold water for a period of time to allow sediment contained in the surface and stormwater runoff directed to the facility to settle out so as to improve the quality of the runoff.
Escarpment	A steep face or a ridge of high land.
Estuarine wetland	Generally, an eelgrass bed; salt marsh; or rocky, sandflat, or mudflat intertidal area where fresh and salt water mix. (Specifically, a tidal wetland with salinity greater than 0.5 parts per thousand, usually semi-enclosed by land but with partially obstructed or sporadic access to the open ocean).
Estuary	An area where fresh water meets salt water, or where the tide meets the river current (e.g., bays, mouths of rivers, salt marshes and lagoons). Estuaries serve as nurseries and spawning and feeding grounds for large groups of marine life and provide shelter and food for birds and wildlife.
Eutrophication	Refers to the process where nutrient over-enrichment of water leads to excessive growth of aquatic plants, especially algae.
Evapotranspiration	The collective term for the processes of evaporation and plant transpiration by which water is returned to the atmosphere.
Excavation	See SCC 30.91E.220. The mechanical removal of earth material.
Exfiltration	The downward movement of runoff through the bottom of an infiltration BMP into the soil layer or the downward movement of water through soil.

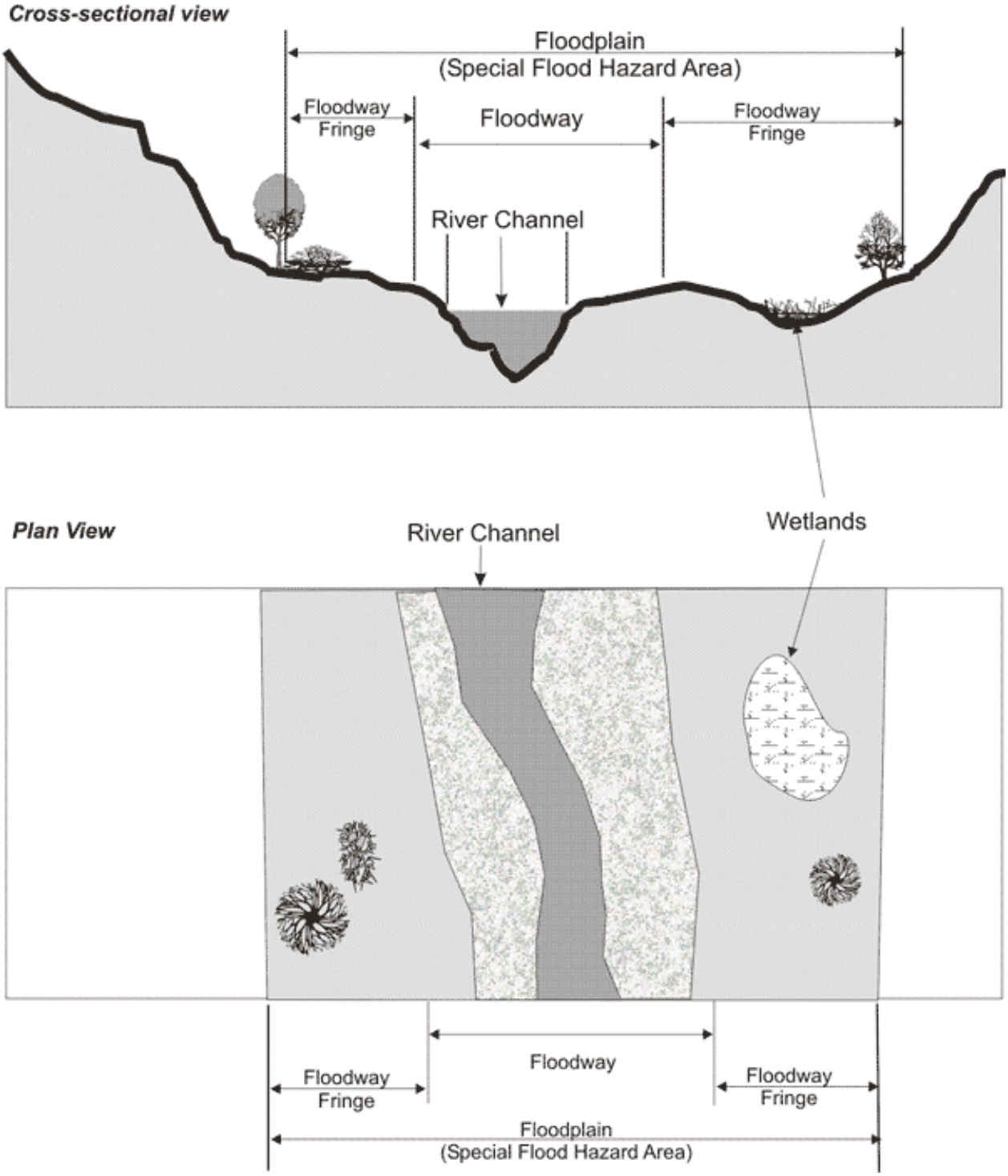
FIRM	See Flood Insurance Rate Map.
Fertilizer	Any material or mixture used to supply one or more of the essential plant nutrient elements.
Fill	See SCC 30.91F.210. A deposit of earth material placed by mechanical means.
Filter fabric	A woven or nonwoven, water-permeable material generally made of synthetic products such as polypropylene and used in stormwater management and erosion and sediment control applications to trap sediment or prevent the clogging of aggregates by fine soil particles.
Filter fabric fence	A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The filter fence is constructed of stakes and synthetic filter fabric with a rigid wire fence backing where necessary for support. Also commonly referred to in the Washington Department of Transportation standard specifications as "construction geotextile for temporary silt fences."
Filter strip	A grassy area with gentle slopes that treats stormwater runoff from adjacent paved areas before it concentrates into a discrete channel.
Flocculation	The process by which suspended colloidal or very fine particles are assembled into larger masses or floccules which eventually settle out of suspension. This process occurs naturally but can also be caused through the use of such chemicals as alum.
Flood or flooding	See SCC 30.91F.360. A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters or the unusual and rapid accumulation of runoff of surface waters from any source.
Flood control	Methods or facilities for reducing flood flows and the extent of flooding.
Flood control project	A structural system installed to protect land and improvements from floods by the construction of dikes, river embankments, channels, or dams.
Flood frequency	The frequency with which the flood of interest may be expected to occur at a site in any average interval of years. Frequency analysis defines the "n-year flood" as being the flood that will, over a long period of time, be equaled or exceeded on the average once every "n" years.

Flood fringe	That portion of the floodplain outside of the floodway which is covered by floodwaters during the base flood; it is generally associated with slower moving or standing water rather than rapidly flowing water.
Flood hazard areas	Those areas subject to inundation by the base flood. Includes, but is not limited to streams, lakes, wetlands, and closed depressions.
Flood insurance rate map	See SCC 30.91F.390. The official map on which the federal insurance administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community
Flood insurance study	See SCC 30.91F.400. The official report provided by the federal insurance administration that includes flood profiles, the flood boundary-floodway map, and the water surface elevation of the base flood.
Flood peak	The highest value of the stage or discharge attained by a flood; thus, peak stage or peak discharge.
Floodplain	See SCC 30.91F.410. A land area adjoining a river, stream, watercourse, ocean, bay, or lake which is likely to be flooded. The extent of the floodplain may vary with the frequency of flooding being considered. The floodplain typically consists of the floodway and the floodway fringe. (See figure 30.91F.410 for illustration)

Figure 30.91F.410

Typical Floodplain

(special Flood Hazard Area)



Floodproofing	See SCC 30.91F.420. Any combination of structural and nonstructural additions, changes or adjustments to properties and structures which reduce or eliminate flood damages to lands, water and sanitary facilities, structures and contents of buildings.
Flood protection elevation	The base flood elevation or higher as defined by the local government.
Flood protection facility	Any levee, berm, wall, enclosure, raise bank, revetment, constructed bank stabilization, or armoring, that is commonly recognized by the community as providing significant protection to a property from inundation by flood waters.
Flood routing	An analytical technique used to compute the effects of system storage dynamics on the shape and movement of flow represented by a hydrograph.
Flood stage	The stage at which overflow of the natural banks of a stream begins.
Floodway	See SCC 30.91F.430. The regular channel of a river, stream, or other watercourse, plus the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. (See figure 30.91F.410 for illustration) .
Floodway fringe	See SCC 30.91F.440.That portion of a floodplain which is inundated by floodwaters but is not within a defined floodway. Floodway fringes serve as temporary storage areas for floodwaters. (See figure 30.91F.410 for illustration)
Flow control facility	A drainage facility designed to mitigate the impacts of increased surface and stormwater runoff flow rates generated by development. Flow control facilities are designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground, or to hold runoff for a short period of time, releasing it to the conveyance system at a controlled rate.
Flow duration	The aggregate time that peak flows are at or above a particular flow rate of interest. For example, the amount of time that peak flows are at or above 50% of the 2-year peak flow rate for a period of record.
Flow frequency	The inverse of the probability that the flow will be equaled or exceeded in any given year (the exceedance probability). For example, if the exceedance probability is 0.01 or 1 in 100, that flow is referred to as the 100-year flow.

Flow path

The route that stormwater runoff follows between two points of interest.

Forebay

An easily maintained, extra storage area provided near an inlet of a BMP to trap incoming sediments before they accumulate in a pond or wetland BMP.

Forest management activities

See SCC 30.91F.470.The growing and harvesting of trees, including all forest practices associated with continued management of forest lands for forest products and excluding those practices associated with the conversion of forest land to a non-forest use unless such lands are reforested to acceptable stocking levels as defined by WAC 222-34. Sludge utilization shall not be considered a forest management activity under this chapter. For purposes of this definition, the meaning of forest practices and forest lands shall be as defined in chapter 76.09 RCW.

Forest practice

Any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber, including but not limited to:

a. Road and trail construction.

b. Harvesting, final and intermediate.

c. Precommercial thinning.

d. Reforestation.

e. Fertilization.

f. Prevention and suppression of diseases and insects.

g. Salvage of trees.

h. Brush control.

Forested communities (wetlands)

In general terms, communities (wetlands) characterized by woody vegetation that is greater than or equal to 6 meters in height; in this manual the term applies to such communities (wetlands) that represent a significant amount of tree cover consisting of species that offer wildlife habitat and other values and advance the performance of wetland functions overall.

Freeboard

The vertical distance between the highest design water surface elevation and the elevation of the crest of the facility. For example, in pond design, freeboard is the vertical distance between the emergency overflow water surface and the top of the pond embankment.

Frequently flooded areas	The 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program or as defined by the local government.
Frost-heave	The upward movement of soil surface due to the expansion of water stored between particles in the first few feet of the soil profile as it freezes. May cause surface fracturing of asphalt or concrete.
Frequency of storm (design storm frequency)	The anticipated period in years that will elapse, based on average probability of storms in the design region, before a storm of a given intensity and/or total volume will recur; thus a 10-year storm can be expected to occur on the average once every 10 years. Sewers designed to handle flows that occur under such storm conditions would be expected to be surcharged by any storms of greater amount or intensity.
Fully controlled limited access highway	A highway where the right of owner or occupants of abutting land or other persons to access, light, air, or view in connection with the highway is controlled to give preference to through traffic by providing access connections with selected public roads only, and by prohibiting crossings or direct private driveway connections at grade. (See WAC 468-58-010)
Fully stabilized	The establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as riprap, gabions or geotextiles) which prevents erosion.
Functions	The ecological (physical, chemical, and biological) processes or attributes of a wetland without regard for their importance to society (see also values). Wetland functions include food chain support, provision of ecosystem diversity and fish and wildlife habitat, floodflow alteration, ground water recharge and discharge, water quality improvement, and soil stabilization.
Gabion	A rectangular or cylindrical wire mesh cage (a chicken wire basket) filled with rock and used as a protecting agent, revetment, etc., against erosion. Soft gabions, often used in streambank stabilization, are made of geotextiles filled with dirt, in between which cuttings are placed.

Gage or gauge	Device for registering precipitation, water level, discharge, velocity, pressure, temperature, etc. Also, a measure of the thickness of metal; e.g., diameter of wire, wall thickness of steel pipe.
Gaging station	A selected section of a stream channel equipped with a gage, recorder, or other facilities for determining stream discharge.
Geologist	See SCC 30.91G.030. A person who has received a degree in geology from an accredited college or university, or a person who has equivalent educational training and substantial experience as a practicing geologist.
Geologic hazard areas	See SCC 30.91G.020. Areas that because of their susceptibility to erosion, sliding, earthquake, or other geologic events, may not be suited to the siting of commercial, residential, or industrial development consistent with public health or safety concerns. Geologically hazardous areas include erosion hazard areas, landslide hazard areas, seismic hazard areas and mine hazard areas as defined in Chapter 30.91 SCC.
Geometrics	The mathematical relationships between points, lines, angles, and surfaces used to measure and identify areas of land.
Geotechnical professional civil engineer	A practicing, geotechnical/civil engineer licensed as a professional Civil Engineer with the ~~State~~state of Washington who has at least four years of professional employment as a geotechnical engineer in responsible charge, including experience with landslide evaluation.
Geotechnical engineer	See SCC 30.91G.040. A licensed civil engineer experienced and knowledgeable in the theory of soil mechanics, geology and geotechnical engineering.
Geotechnical engineering	See SCC 30.91G.050.The application of geologic knowledge and principles in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works projects. "Geotechnical engineering" also means the application of soils mechanics in the investigation, evaluation and design of civil works involving the use of earth materials and the inspection or testing thereof.
Grade	See SCC 30.91G.070.The elevation of the ground surface.

	(1) "Existing grade" means the elevation of the ground surface prior to development activity. (2) "Rough grade" means the stage at which the elevation of the ground surface approximately conforms to the approved plan. (3) "Finish grade" means the final elevation of the ground surface which conforms to the approved grading plan.
(To) Grade	To finish the surface of a canal bed, roadbed, top of embankment or bottom of excavation.
Gradient terrace	An earth embankment or a ridge-and-channel constructed with suitable spacing and an acceptable grade to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a stable nonerosive velocity.
Grassed waterway	A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water from an area at a reduced flow rate. See also biofilter.
Groundwater	See SCC 30.91G.100. The portion of water contained in interconnected pores or fractures in a saturated zone or stratum located beneath the surface of the earth or below a surface water body.
Ground water recharge	Inflow to a ground water reservoir.
Ground water table	The free surface of the ground water, that surface subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is seldom static.
Gully	A channel caused by the concentrated flow of surface and stormwater runoff over unprotected erodible land.
Habitat	The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be protected from harmful biological, chemical, and physical alterations.
Hardpan	A cemented or compacted and often clay-like layer of soil that is impenetrable by roots. Also known as glacial till.
Hard surface	An impervious surface, a permeable pavement, or a vegetated roof.
Harmful pollutant	A substance that has adverse effects to an organism including immediate death, chronic poisoning, impaired reproduction, cancer or other effects.

Head (hydraulics) The height of water above any plane of reference. The energy, either kinetic or potential, possessed by each unit weight of a liquid, expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed. Used in various compound terms such as pressure head, velocity head, and head loss.

Head loss Energy loss due to friction, eddies, changes in velocity, or direction of flow.

Heavy metals Metals of high specific gravity, present in municipal and industrial wastes, that pose long-term environmental hazards. Such metals include cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

High-use site High-use sites are those that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. High-use sites include:

- An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area;
- An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil;
- An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.);
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

Hog fuel See wood-based mulch.

Horton overland flow A runoff process whereby the rainfall rate exceeds the infiltration rate, so that the precipitation that does not infiltrate flows downhill over the soil surface.

Hydrological simulation program-fortran (HSPF) A continuous simulation hydrologic model that transforms an uninterrupted rainfall record into a concurrent series of runoff or flow data by means of a set of mathematical algorithms which represent the rainfall-runoff process at some conceptual level.

Humus Organic matter in or on a soil, composed of partly or fully decomposed bits of plant tissue or from animal manure.

Hydraulic conductivity	The quality of saturated soil that enables water or air to move through it. Also known as permeability coefficient
Hydraulic gradient	Slope of the potential head relative to a fixed datum.
Hydrodynamics	Means the dynamic energy, force, or motion of fluids as affected by the physical forces acting upon those fluids.
Hydrograph	A graph of runoff rate, inflow rate or discharge rate, past a specific point over time.
Hydrologic cycle	The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration.

Hydrologic soil groups

A soil characteristic classification system defined by the U.S. Soil Conservation Service in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties.

Type A: Low runoff potential. Soils having high infiltration rates, even when thoroughly wetted, and consisting chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Type B: Moderately low runoff potential. Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Type C: Moderately high runoff potential. Soils having slow infiltration rates when thoroughly wetted, and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission.

Type D: High runoff potential. Soils having very slow infiltration rates when thoroughly wetted, and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a hardpan, till, or clay layer at or near the surface, soils with a compacted subgrade at or near the surface, and shallow soils or nearly impervious material. These soils have a very slow rate of water transmission.[1]

[1] Vladimir Novotny and Harvey Olem. *Water Quality Prevention, Identification, and Management of Diffuse Pollution,* Van Nostrand Reinhold: New York, 1994, p. 109.

Hydrology

The science of the behavior of water in the atmosphere, on the surface of the earth, and underground.

Hydroperiod

A seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.

Hyetograph

A graph of percentages of total precipitation for a series of time steps representing the total time in which precipitation occurs.

Illicit discharge	All non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or ground water quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and greywater systems.
Impact basin	A device used to dissipate the energy of flowing water. Generally constructed of concrete in the form of a partially depressed or partially submerged vessel, it may utilize baffles to dissipate velocities.
Impervious	A surface which cannot be easily penetrated. For instance, rain does not readily penetrate paved surfaces.
Impervious surface	An unvegetated area that either prevents or retards the entry of water into the soil mantle as compared to infiltration under natural conditions prior to development. An unvegetated area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow that was present under natural conditions, prior to development. Common impervious surfaces include, but are not limited to, roofs, walkways, patios, driveways, parking lots, storage areas, concrete or asphalt paving, graveled areas and roads, packed earthen materials, surfaces covered by oil, macadam, asphalt treated base material (ATB), bituminous surface treatment (BST), chip seal, seal coat or emulsified asphalt and cutback asphalt cement, and other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention and detention facilities shall not be considered impervious surfaces for purposes of determining whether the thresholds for applying minimum stormwater management requirements are exceeded pursuant to Chapter 30.63A SCC. However, open, uncovered retention and detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
Impoundment	A natural or man-made containment for surface water.
Improvement	Streets (with or without curbs or gutters), sidewalks, crosswalks, parking lots, water mains, sanitary and storm sewers, drainage facilities, street trees and other appropriate items.

Industrial activities	Material handling, transportation, or storage; manufacturing; maintenance; treatment; or disposal. Areas with industrial activities include plant yards, access roads and rail lines used by carriers of raw materials, manufactured products, waste material, or by-products; material handling sites; refuse sites; sites used for the application or disposal of process waste waters; sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.
Infiltration	The hydrologic process of storm water runoff soaking into the subsoil, commonly referred to as percolation
Infiltration facility (or system)	A drainage facility designed to use the hydrologic process of surface and stormwater runoff soaking into the ground, commonly referred to as a percolation, to dispose of surface and stormwater runoff.
Infiltration rate	The rate, usually expressed in inches/hour, at which water moves downward (percolates) through the soil profile. Short-term infiltration rates may be inferred from soil analysis or texture or derived from field measurements. Long-term infiltration rates are affected by variability in soils and subsurface conditions at the site, the effectiveness of pretreatment or influent control, and the degree of long-term maintenance of the infiltration facility.
Ingress/egress	The points of access to and from a property.
Inlet	A form of connection between surface of the ground and a drain or sewer for the admission of surface and stormwater runoff.
Insecticide	A substance, usually chemical, that is used to kill insects.
Interception (hydraulics)	The process by which precipitation is caught and held by foliage, twigs, and branches of trees, shrubs, and other vegetation. Often used for "interception loss" or the amount of water evaporated from the precipitation intercepted.

Interflow	That portion of rainfall that infiltrates into the soil and moves laterally through the upper soil horizons until intercepted by a stream channel or until it returns to the surface, for example, in a roadside ditch, wetland, spring or seep. Interflow is a function of the soil system depth, permeability, and water-holding capacity.
Intermittent stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from melting snow or other sources. It is dry for a large part of the year, ordinarily more than three months.
Invasive weedy plant species	Opportunistic species of inferior biological value that tend to out-compete more desirable forms and become dominant; applied to non-native species in this manual.
Invert	The lowest point on the inside of a sewer or other conduit.
Invert elevation	The vertical elevation of a pipe or orifice in a pond that defines the water level.
Isopluvial map	A map with lines representing constant depth of total precipitation for a given return frequency.
Lag time	The interval between the center of mass of the storm precipitation and the peak flow of the resultant runoff.

Lake

See SCC 30.91L.010. A body of freshwater that:

(1) Occurs in a depression of land or expanded part of a stream, including reservoirs;

(2) Is greater than 6.6 feet (2 meters) in depth at the deepest point at ordinary low water;

(3) Has less than 30% coverage by trees, shrubs, or persistent emergent vegetation; and.

(4) Has an ocean-derived salinity of less than 0.5 parts per thousand (ppt).

A lake is bounded by the ordinary high water mark, or, where a stream enters the lake, the extension of the elevation of the lake's ordinary high water mark within the stream. Lakes formed by a dam on a stream or river are bounded by a contour approximating the normal spillway elevation or normal pool elevation.

Lakes do not include artificial water bodies including, but not limited to, lakes constructed for irrigation or detention, wastewater treatment facilities, farm ponds, recreational or fishing ponds or other landscape ponds, unless they contain naturally occurring salmonids. Naturally occurring means that the salmonids have migrated into the lake via a connection to another water body containing salmonids and are not artificially introduced into the lake.

Land disturbing activity

Any activity that will result in movement of earth or a change in the existing soil cover or the existing soil topography (both vegetative and non-vegetative), including the creation and/or replacement of impervious surfaces. Land disturbing activities include, but are not limited to, clearing, filling, excavation, and grading. Land disturbing activities do not include agricultural plowing and tilling exempt from stormwater regulations pursuant to SCC 30.63A.200. Compaction that is associated with stabilization of structures and road construction also is a land disturbing activity. Vegetation management practices, including landscape maintenance and gardening, are not land disturbing activities.~~and~~ ~~d~~Drainage facility maintenance practices are not land disturbing activities, provided that the maintenance is performed according to standards adopted by Snohomish County.

Landslide

See SCC 30.91L.030. Downslope movement of a mass of soil, rock, snow or ice including, but not limited to, rock falls, slumps, mud flows, debris flows, torrents, earth flows and snow avalanches.

Landslide hazard areas

See SCC 30.91L.040. Areas potentially subject to mass earth movement based on a combination of geologic, topographic, and hydrologic factors, with a vertical height of 10 feet or more. These include the following:

(1) Areas of historic landslides as evidenced by landslide deposits, avalanche tracks, and areas susceptible to basal undercutting by streams, rivers or waves;

(2) Areas with slopes steeper than 33~~ percent~~% which intersect geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock, and which contain springs or ground water seeps; or

(3) Areas located in a canyon or an active alluvial fan, susceptible to inundation by debris flows or catastrophic flooding.

Leachable materials

Those substances that, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils, uncovered process wastes, manure, fertilizers, oil substances, ashes, kiln dust, and garbage dumpster leakage.

Leachate

Liquid that has percolated through soil and contains substances in solution or suspension.

Leaching

Removal of the more soluble materials from the soil by percolating waters.

Legume

A member of the legume or pulse family, Leguminosae, one of the most important and widely distributed plant families. The fruit is a "legume" or pod. Includes many valuable food and forage species, such as peas, beans, clovers, alfalfas, sweet clovers, and vetches. Practically all legumes are nitrogen-fixing plants.

Level pool routing

The basic technique of storage routing used for sizing and analyzing detention storage and determining water levels for ponding water bodies. The level pool routing technique is based on the continuity equation: Inflow – Outflow = Change in storage.

Level spreader

A temporary ESC device used to spread out stormwater runoff uniformly over the ground surface as sheet flow (i.e., not through channels). The purpose of level spreaders is to prevent concentrated, erosive flows from occurring, and to enhance infiltration.

Local government

Any county, city, town, or special purpose district having its own incorporated government for local affairs.

Low flow channel	An incised or paved channel from inlet to outlet in a dry basin which is designed to carry low runoff flows and/or baseflow, directly to the outlet without detention.
Low impact development	**A** stormwater management and land development strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.
Low impact development BMPs	Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of filtration, storage, evaporation, infiltration and transpiration. Low impact development BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water re-use.
Low permeability liner	A layer of compacted till, compacted clay, concrete, or a geomembrane.
MDNS	A Mitigated Determination of Nonsignificance (See DNS and Mitigation).
Maintenance	See SCC 30.91M.011. Activities conducted on currently serviceable structures, facilities and equipment that involve no expansion or use beyond that previously existing and result in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse or cessation in the use of structures and systems. Those usual activities may include replacement of dysfunctional facilities, including cases where any permit requires replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed. ~~Maintenance does not include expansion in physical dimension, capacity or use.~~

Manning's equation An equation used to predict the velocity of water flow in an open channel or pipelines:

$$V = \frac{1.486R^{2/3}S^{1/2}}{n}$$

where:

V is the mean velocity of flow in feet per second

R is the hydraulic radius in feet

S is the slope of the energy gradient or, for assumed uniform flow, the slope of the channel in feet per foot; and

n is Manning's roughness coefficient or retardance factor of the channel lining.

Mass wasting The movement of large volumes of earth material downslope.

Master drainage plan A comprehensive drainage control plan intended to prevent significant adverse impacts to the natural and manmade drainage system, both on and off-site.

Mean annual water level fluctuation Derived as follows:

(1) Measure the maximum water level (e.g., with a crest stage gage, Reinelt and Horner 1990) and the existing water level at the time of the site visit (e.g., with a staff gage) on at least eight occasions spread through a year.

(2) Take the difference of the maximum and existing water level on each occasion and divide by the number of occasions.

Mean depth Average depth; cross-sectional area of a stream or channel divided by its surface or top width.

Mean velocity The average velocity of a stream flowing in a channel or conduit at a given cross-section or in a given reach. It is equal to the discharge divided by the cross-sectional area of the reach.

Measuring weir A shaped notch through which water flows are measured. Common shapes are rectangular, trapezoidal, and triangular.

Mechanical analysis The analytical procedure by which soil particles are separated to determine the particle size distribution.

Mechanical practices Soil and water conservation practices that primarily change the surface of the land or that store, convey, regulate, or dispose of runoff water without excessive erosion.

Metals

Elements, such as mercury, lead, nickel, zinc and cadmium, which are of environmental concern because they do not degrade over time. Although many are necessary nutrients, they are sometimes magnified in the food chain, and they can be toxic to life in high enough concentrations. They are also referred to as heavy metals.

Microbes

The lower trophic levels of the soil food web. They are normally considered to include bacteria, fungi, flagellates, amoebae, ciliates, and nematodes. These in turn support the higher trophic levels, such as mites and earthworms. Together they are the basic life forms that are necessary for plant growth. Soil microbes also function to bioremediate pollutants such as petroleum, nutrients, and pathogens.

Mitigation

See SCC 30.91M.120. "Mitigation" means:

(1) Avoiding the impact altogether by not taking a certain action or parts of an action;

(2) Minimizing impact by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

(3) Rectifying the impact by repairing, rehabilitating or restoring the affected environment;

(4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

(5) Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; or

(6) Monitoring the impact and taking appropriate corrective measures.

Modification, modified (wetland)

A wetland whose physical, hydrological, or water quality characteristics have been purposefully altered for a management purpose, such as by dredging, filling, forebay construction, and inlet or outlet control.

Monitor

To systematically and repeatedly measure something in order to track changes.

Monitoring

The collection of data by various methods for the purposes of understanding natural systems and features, evaluating the impacts of development proposals on such systems, and assessing the performance of mitigation measures imposed as conditions of development.

Mulch

A layer of organic material or aggregate applied to the surface of soil. Organic mulch may be composed of chipped site vegetation, compost, hydromulch, wood-based or wood straw, wood strand, or straw.

NGPE	See Native Growth Protection Easement.
NGVD	National Geodetic Vertical Datum.
NPDES	The National Pollutant Discharge Elimination System as established by the Federal Clean Water Act.
National pollutant discharge elimination system (NPDES)	The part of the federal Clean Water Act, which requires point source dischargers to obtain permits. These permits are referred to as NPDES permits and, in Washington ~~State~~state, are administered by the Washington State Department of Ecology.
Native growth protection easement (NGPE)	An easement granted for the protection of native vegetation within a critical area or its associated buffer. The NGPE shall be recorded on the appropriate documents of title and filed with the Snohomish County Records Division.
Native vegetation	Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas fir, Western Hemlock, Western Red Cedar, Alder, Big-leaf Maple, and Vine Maple; shrubs such as willow, elderberry, salmonberry and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.
Natural location	Means the location of those channels, swales, and other non-manmade conveyance systems as defined by the first documented topographic contours existing for the subject property, either from maps or photographs, or such other means as appropriate. In the case of outwash soils with relatively flat terrain, no natural location of surface discharge may exist.
New development	The following land disturbing activities: Class IV - general forest practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of hard surfaces; and subdivisions, short subdivisions, residential condominiums, single-family detached units (SFDU), residential condominiums, planned residential developments (PRD) and binding site plans. Projects meeting the definition of redevelopment shall not be considered new development.

Nitrate (NO_3)	A form of nitrogen which is an essential nutrient to plants. It can cause algal blooms in water if all other nutrients are present in sufficient quantities. It is a product of bacterial oxidation of other forms of nitrogen, from the atmosphere during electrical storms and from fertilizer manufacturing.
Nitrification	The biochemical oxidation process by which ammonia is changed first to nitrites and then to nitrates by bacterial action, consuming oxygen in the water.
Nitrogen, available	Usually ammonium, nitrite, and nitrate ions, and certain simple amines available for plant growth. A small fraction of organic or total nitrogen in the soil is available at any time.
Nonpoint source	
Pollution	Pollution that enters a waterbody from diffuse origins on the watershed and does not result from discernible, confined, or discrete conveyances.
Normal depth	The depth of uniform flow. This is a unique depth of flow for any combination of channel characteristics and flow conditions. Normal depth is calculated using Manning's Equation.
NRCS method	See SCS Method.
Nutrients	Essential chemicals needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality and algal blooms. Some nutrients can be toxic at high concentrations.
Off-line facilities	Water quality treatment facilities to which stormwater runoff is restricted to some maximum flow rate or volume by a flow-splitter.
Off-site	Any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.
Off-system storage	Facilities for holding or retaining excess flows over and above the carrying capacity of the stormwater conveyance system, in chambers, tanks, lagoons, ponds, or other basins that are not a part of the subsurface sewer system.
Oil/water separator	A vault, usually underground, designed to provide a quiescent environment to separate oil from water.

On-line facilities	Water quality treatment facilities which receive all of the stormwater runoff from a drainage area. Flows above the water quality design flow rate or volume are passed through at a lower percent removal efficiency.
On-site	The entire property that includes the proposed development.
On-site stormwater management BMPs	Site development techniques that serve to infiltrate, disperse, and retain stormwater runoff on-site.
Operational BMPs	Operational BMPs are a type of Source Control BMP. They are schedules of activities, prohibition of practices, and other managerial practices to prevent or reduce pollutants from entering stormwater. Operational BMPs include formation of a pollution prevention team, good housekeeping, preventive maintenance procedures, spill prevention and clean-up, employee training, inspections of pollutant sources and BMPs, and record keeping. They can also include process changes, raw material/product changes, and recycling wastes.

Ordinary high water mark

See SCC 30.91O.030. On all lakes, streams and tidal waters, is the mark that will be found by examining the beds and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, with respect to vegetation. The following criteria clarify this mark on tidal waters, lakes, and streams:

(1) Tidal waters.

(a) in high energy environments where the action of waves or currents is sufficient to prevent vegetation establishment below mean higher high tide, the ordinary high water mark is coincident with the line of vegetation. Where there is no vegetative cover for less than one hundred feet parallel to the shoreline, the ordinary high water mark is the average tidal elevation of the adjacent lines of vegetation. Where the ordinary high water mark cannot be found, it is the elevation of mean higher high tide.

(b) in low energy saltwater environments where the action of waves and currents is not sufficient to prevent vegetation establishment below mean higher high tide, the ordinary high water mark is coincident with the landward limit of hydrophytic salt tolerant vegetation. "Salt tolerant vegetation" means vegetation which is tolerant of interstitial soil salinities greater than or equal to 0.5 parts per thousand (ppt);

(c) In low energy freshwater environments where the action of the water is not sufficient to prevent vegetation establishment below the mean higher high tide, use the mean higher high tide elevation or one or more the following indicators: landward limits of drift logs or other drift deposits, presence of hydrophytic plants, presence of hydric soils, soil surface changes from algae, or sediment deposition areas to areas where the soils show no sign of depositional processes from water;

(2) Lakes. Where the ordinary high water mark cannot be found, it shall be the line of mean high water;

(3) Streams. Where the ordinary high water mark cannot be found, it shall be the line of mean high water. For braided streams, the ordinary high water mark is found on the banks forming the outer limits of the depression within which the braiding occurs.

Organic matter	Organic matter as decomposed animal or vegetable matter. It is measured by ASTM D 2974. Organic matter is an important reservoir of carbon and a dynamic component of soil and the carbon cycle. It improves soil and plant efficiency by improving soil physical properties including drainage, aeration, and other structural characteristics. It contains the nutrients, microbes, and higher-form soil food web organisms necessary for plant growth. The maturity of organic matter is a measure of its beneficial properties. Raw organic matter can release water-soluble nutrients (similar to chemical fertilizer). Beneficial organic matter has undergone a humification process either naturally in the environment or through a composting process.
Orifice	An opening with closed perimeter, usually sharp-edged, and of regular form in a plate, wall, or partition through which water may flow, generally used for the purpose of measurement or control of water.
Outlet	Point of water disposal from a stream, river, lake, tidewater, or artificial drain.
Outlet channel	A waterway constructed or altered primarily to carry water from man-made structures, such as terraces, tile lines, and diversions.
Outwash soils	Soils formed from highly permeable sands and gravels.
Overflow	A pipeline or conduit device, together with an outlet pipe, that provides for the discharge of portions of combined sewer flows into receiving waters or other points of disposal, after a regular device has allowed the portion of the flow which can be handled by interceptor sewer lines and pumping and treatment facilities to be carried by and to such water pollution control structures.
Overflow rate	Detention basin release rate divided by the surface area of the basin. It can be thought of as an average flow rate through the basin.
Overtopping	To flow over the limits of a containment or conveyance element.
Partially controlled limited access highway	A highway where the right of owner or occupants of abutting land or other persons to access, light, air, or view in connection with the highway is controlled to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings and some private driveway connections at grade. (See WAC 468-58-010)
Particle size	The effective diameter of a particle as measured by sedimentation, sieving, or micrometric methods.

Peak discharge	See SCC 30.91P.120. The maximum instantaneous rate of storm water runoff in cubic feet per second (cfs) or cubic meters per second (cms) determined for the design storm.
Peak-shaving	Controlling post-development peak discharge rates to pre-development levels by providing temporary detention in a BMP.
Percolation	The movement of water through soil.
Percolation rate	The rate, often expressed in minutes/inch, at which clear water, maintained at a relatively constant depth, will seep out of a standardized test hole that has been previously saturated. The term percolation rate is often used synonymously with infiltration rate (short-term infiltration rate).
Permanent stormwater control (PSC) plan	A plan which includes permanent BMPs for the control of pollution from stormwater runoff after construction and/or land disturbing activity has been completed
Permeable soils	Soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as SCS hydrologic soil types A and B.
Person	See SCC 30.91P.160. An individual, partnership, corporation, association, organization, cooperative, public or municipal corporation, or agency of the state or local governmental unit, or an agent or representative thereof.
Perviousness	Related to the size and continuity of void spaces in soils; related to a soil's infiltration rate.
Pervious surface	A surface material that allows stormwater to infiltrate into the ground. Examples include lawn, landscape, pasture, native vegetation areas, and permeable pavements.
Pesticide	A general term used to describe any substance - usually chemical - used to destroy or control organisms; includes herbicides, insecticides, algicides, fungicides, and others. Many of these substances are manufactured and are not naturally found in the environment. Others, such as pyrethrum, are natural toxins that are extracted from plants and animals.
pH	A measure of the alkalinity or acidity of a substance which is conducted by measuring the concentration of hydrogen ions in the substance. A pH of 7.0 indicates neutral water. A 6.5 reading is slightly acid.

Physiographic	Characteristics of the natural physical environment (including hills).
Plan approval authority	The Plan Approval Authority is defined as that department within a local government that has been delegated authority to approve stormwater site plans.
Planned unit development (PUD)	A special classification authorized in some zoning ordinances, where a unit of land under control of a single developer may be used for a variety of uses and densities, subject to review and approval by the local governing body. The locations of the zones are usually decided on a case-by-case basis.
Plat	A map or representation of a subdivision showing the division of a tract or parcel of land into lots, blocks, streets, or other divisions and dedications. (NOTE: See also SCC 30.91P.220 - "Plat, final," SCC 30.91P.230 - "Plat, final short," and SCC 30.91P.240 -"Plat, preliminary."
Plunge pool	A device used to dissipate the energy of flowing water that may be constructed or made by the action of flowing. These facilities may be protected by various lining materials.
Point discharge	The release of collected and/or concentrated surface and stormwater runoff from a pipe, culvert, or channel.
Point of compliance	The location at which compliance with a discharge performance standard or a receiving water quality standard is measured.
Pollution	Contamination or other alteration of the physical, chemical, or biological properties, of waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.
Pollution generating hard surface	Those hard surfaces considered to be a significant source of pollutants in stormwater runoff. See the listing of surfaces under pollution-generating impervious surface.

Pollution generating impervious surface	Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are regularly subject to: vehicular use, industrial activities, or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff and are PGIS. Examples include, but are not limited to, erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered PGIS unless they are coated with an inert, non-leachable material such as baked-on enamel coating. The following surfaces are considered regularly-used by motor vehicles: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways. A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following surfaces are not considered to be regularly-used surfaces by motor vehicles: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, and infrequently used maintenance access roads.
Pollution-generating pervious surfaces	Any non-impervious surface subject to vehicular use, industrial activities, or storage of erodible or leachable materials, wastes or chemicals, and that receive direct rainfall or run-on or blow-in of rainfall, use of pesticides and fertilizers, or loss of soil. Typical PGPS include permeable pavement subject to vehicular use, lawns and landscaped areas including: golf courses, parks, cemeteries, and sports fields (natural and artificial turf).
Predeveloped condition	A fully-forested condition (soils and vegetation) to which an ~~Ecology~~ approved continuous runoff hydrologic model is calibrated, unless reasonable, historic information is provided that indicates the site was prairie prior to Euro-American settlement.
Prediction	For the purposes of this document an expected outcome based on the results of hydrologic modeling and/or the judgment of a trained professional civil engineer or geologist.
Pretreatment	The removal of material such as solids, grit, grease, and scum from flows prior to physical, biological, or physical treatment processes to improve treatability. Pretreatment may include screening, grit

	removal, settling, oil/water separation, or application of a Basic Treatment BMP prior to infiltration.
Priority peat systems	Unique, irreplaceable fens that can exhibit water pH in a wide range from highly acidic to alkaline, including fens typified by Sphagnum species, Ledum groenlandicum (Labrador tea), Drosera rotundifolia (sundew), and Vaccinium oxycoccos (bog cranberry); marl fens; estuarine peat deposits; and other moss peat systems with relatively diverse, undisturbed flora and fauna. Bog is the common name for peat systems having the Sphagnum association described, but this term applies strictly only to systems that receive water income from precipitation exclusively.
Professional civil engineer	A person registered with the state of Washington as a professional engineer in civil engineering.
Project	Any proposed action to alter or develop a site. The proposed action of a permit application or an approval, which requires drainage review.
Project site	That portion of a property, properties, or right of way subject to land disturbing activities, new hard surfaces, or replaced hard surfaces.
Project proponent	Any individual, person, partnership, corporation, association, organization, cooperative, public or municipal corporation, or agency of the state or local governmental unit, or an agent or representative thereof proposing a development activity or project permit.
Properly functioning soil system (PFSS)	Equivalent to engineered soil/landscape system. This can also be a natural system that has not been disturbed or modified.
Public regional stormwater management facility	See SCC 30.91P.400. A retention or detention facility serving more than one site and constructed or owned by a public agency.
Puget sound basin	Puget Sound south of Admiralty Inlet (including Hood Canal and Saratoga Passage); the waters north to the Canadian border, including portions of the Strait of Georgia; the Strait of Juan de Fuca south of the Canadian border; and all the lands draining into these waters as mapped in Water Resources Inventory Areas numbers 1 through 19, set forth in WAC 173-500-040.
R/D	See Retention/detention facility.

Rare, threatened, or endangered species	Plant or animal species that are regional relatively uncommon, are nearing endangered status, or whose existence is in immediate jeopardy and is usually restricted to highly specific habitats. Threatened and endangered species are officially listed by federal and state authorities, whereas rare species are unofficial species of concern that fit the above definitions.
Rational method	A means of computing storm drainage flow rates (Q) by use of the formula Q = CIA, where C is a coefficient describing the physical drainage area, I is the rainfall intensity and A is the area. ~~This method is no longer used in the technical manual.~~
Reach	A length of channel with uniform characteristics.
Receiving water body/receiving waters	Naturally and/or reconstructed naturally occurring surface water bodies, such as creeks, streams, rivers, lakes, wetlands, estuaries, and marine waters, or groundwater.
Recharge	The addition of water to the zone of saturation (i.e., an aquifer).
Recommended BMPs	As used in Volume IV, recommended BMPs are those BMPs that are not expected to be mandatory by local governments at new development and redevelopment sites. However, they may improve pollutant control efficiency, and may provide a more comprehensive and environmentally effective stormwater management program.
Redevelopment	The following activities that take place on a site that already has 35 percent or more existing hard surface coverage: the creation of new hard surface(s); structural development including construction, installation, expansion or replacement of a building footprint or other structure; replacement of existing hard surface that is not maintenance; and land disturbing activity.
Regional	An action (here, for stormwater management purposes) that involves more than one discrete property.
Regional detention facility	See 30.91P.400 "Public regional storm water management facility (public regional facility)".
Release rate	The computed peak rate of surface and stormwater runoff from a site.

Replaced hard surface	For structures, the removal and replacement of hard surfaces down to the foundation. For other hard surfaces, the removal down to bare soil or base course and replacement.
Replaced impervious surface	For structures, the removal and replacement of impervious surfaces down to the foundation. For other impervious surfaces, the removal down to bare soil or base course and replacement.
Residential density	The number of dwelling units per unit of surface area. Net density includes only occupied land. Gross density includes unoccupied portions of residential areas, such as roads and open space.
Restoration	Actions performed to reestablish wetland functional characteristics and processes that have been lost by alterations, activities, or catastrophic events in an area that no longer meets the definition of a wetland.
Retention	The process of collecting and holding surface and stormwater runoff with no surface outflow.
Retention facility	See SCC 30.91R.170. An open or closed facility, such as a pond or tank, that stores storm water runoff without release except by means of evaporation, plant transpiration or infiltration into the ground. The facility includes the flow control structure, the infiltration system, the inlet and outlet pipes, and all maintenance access points.
Retrofitting	The renovation of an existing structure or facility to meet changed conditions or to improve performance.
Return frequency	A statistical term for the average time of expected interval that an event of some kind will equal or exceed given conditions (e.g., a stormwater flow that occurs every 2 years).
Rhizome	A modified plant stem that grows horizontally underground.
Riffles	Fast sections of a stream where shallow water races over stones and gravel. Riffles usually support a wider variety of bottom organisms than other stream sections.
Rill	A small intermittent watercourse with steep sides, usually only a few inches deep. Often rills are caused by an increase in surface water flow when soil is cleared of vegetation.
Riprap	A facing layer or protective mound of rocks placed to prevent erosion or sloughing of a structure or embankment due to flow of surface and stormwater runoff.
Riparian	Pertaining to the banks of streams, wetlands, lakes, or tidewater.

Riser	A vertical pipe extending from the bottom of a pond BMP that is used to control the discharge rate from a BMP for a specified design storm.
Road, private	See SCC 30.91R.230. A privately maintained easement or parcel created to provide vehicle access from a public road to one or more lots, and where appropriate, may include pedestrian, equestrian and bicycle facilities. Limits may include the outside edge of sidewalks, or curbs and gutters, planter strips, paths, walkways, or side ditches, including the appertaining shoulder and all slopes, ditches, channels, waterways, and other features necessary for proper drainage and structural stability within the easement or parcel.
Rodenticide	A substance used to destroy rodents.
Runoff	See SCC 30.91R.252. Water that travels across the land surface and discharges to water bodies either directly or through a collection and conveyance system. See also "Stormwater."~~See SCC 30.91R.252. Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes and wetlands as well as shallow groundwater. It includes the portion of rainfall or other precipitation that becomes surface flow and interflow.~~
SCS	Soil Conservation Service (now the Natural Resources Conservation Service), U.S. Department of Agriculture
SCS method	A single-event hydrologic analysis technique for estimating runoff based on the Curve Number method. The Curve Numbers are published by NRCS *in Urban Hydrology for Small Watersheds, 55 TR, June 1976*. With the change in name to the Natural Resource Conservation Service, the method may be referred to as the NRCS Method.
SEPA	See State Environmental Policy Act.
Salmonid	See SCC 30.91S.010 A member of the fish family salmonidae including chinook, coho, chum, sockeye, and pink salmon; rainbow, steelhead, searun cutthroat, cutthroat trout, brown and bull trout; brook and Dolly Varden char; kokanee and whitefish.
Sand filter	A man-made depression or basin with a layer of sand that treats stormwater as it percolates through the sand and is discharged via a central collector pipe.
Saturation point	In soils, the point at which a soil or an aquifer will no longer absorb any amount of water without losing an equal amount.
Scour	Erosion of channel banks due to excessive velocity of the flow of surface and stormwater runoff.

Sediment	Fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.
Sedimentation	The depositing or formation of sediment.
Sensitive emergent vegetation communities	Assemblages of erect, rooted, herbaceous vegetation, excluding mosses and lichens, at least some of whose members have relatively narrow ranges of environmental requirements, such as hydroperiod, nutrition, temperature, and light. Examples include fen species such as sundew and, as well as a number of species of Carex (sedges).
Sensitive life stages	Stages during which organisms have limited mobility or alternatives in securing the necessities of life, especially including reproduction, rearing, and migration periods.
Sensitive scrub-shrub vegetation communities	Assemblages of woody vegetation less than 6 meters in height, at least some of whose members have relatively narrow ranges of environmental requirements, such as hydroperiod, nutrition, temperature, and light. Examples include fen species such as Labrador tea, bog laurel, and cranberry.
Settleable solids	Those suspended solids in stormwater that separate by settling when the stormwater is held in a quiescent condition for a specified time.
Sheet erosion	The relatively uniform removal of soil from an area without the development of conspicuous water channels.
Sheet flow	Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.
Shoreline development	The proposed project as regulated by the Shoreline Management Act. Usually the construction over water or within a shoreline zone (generally 200 feet landward of the water) of structures such as buildings, piers, bulkheads, and breakwaters, including environmental alterations such as dredging and filling, or any project which interferes with public navigational rights on the surface waters.
Short circuiting	The passage of runoff through a BMP in less than the design treatment time.

Siltation The process by which a river, lake, or other waterbody becomes clogged with sediment. Silt can clog gravel beds and prevent successful salmon spawning.

Site The area defined by the legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment including contiguous improvements in the right of way. For road projects, the length of the project site and right-of-way boundaries define the site.

Slope An inclined ground surface, the inclination of which is expressed as a ratio of horizontal distance to vertical distance or as a percentage of rise over run (vertical over horizontal distance. (See figure 30.91S.400 for illustrations) Average slope is determined for the site by using the time of concentration line as the horizontal length and the vertical difference along said line. Slope is the vertical difference divided by the horizontal length expressed as a percentage. The overall site risk is based on the highest risk slope being disturbed with an area of 5,000 square feet or more.

Sloughing The sliding of overlying material. It is the same effect as caving, but it usually occurs when the bank or an underlying stratum is saturated or scoured.

Soil See SCC 30.91S.460. The naturally occurring, unconsolidated mineral and organic material deposits overlying bedrock.

Soil group, hydrologic A classification of soils by the Soil Conservation Service into four runoff potential groups. The groups range from A soils, which are very permeable and produce little or no runoff, to D soils, which are not very permeable and produce much more runoff.

Soil horizon A layer of soil, approximately parallel to the surface, which has distinct characteristics produced by soil-forming factors.

Soil profile A vertical section of the soil from the surface through all horizons, including C horizons.

Soil structure The relation of particles or groups of particles which impart to the whole soil a characteristic manner of breaking; some types are crumb structure, block structure, platy structure, and columnar structure.

Soil permeability The ease with which gases, liquids, or plant roots penetrate or pass through a layer of soil.

Soil stabilization The use of measures such as rock lining, vegetation or other engineering structures to prevent the movement of soil when loads are applied to the soil.

Soil texture class	The relative proportion, by weight, of particle sizes, based on the USDA system, of individual soil grains less than 2 mm equivalent diameter in a mass of soil. The basic texture classes in the approximate order of increasing proportions of fine particles include: sand, loamy sand, sandy loam, loam, silt loam, silt, clay loam, sandy clay, silty clay, and clay.
Sorption	The physical or chemical binding of pollutants to sediment or organic particles.
Source control best management practice	Structures, equipment, supplies or operations intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants.
Spill control device	A Tee section or turn down elbow designed to retain a limited volume of pollutant that floats on water, such as oil or antifreeze. Spill control devices are passive and must be cleaned-out for the spilled pollutant to actually be removed.
Spillway	A passage such as a paved apron or channel for surplus water over or around a dam or similar obstruction. An open or closed channel, or both, used to convey excess water from a reservoir. It may contain gates, either manually or automatically controlled, to regulate the discharge of excess water.
State environmental policy act (SEPA) RCW 43.21C	The Washington ~~State~~state law intended to minimize environmental damage. SEPA requires that state agencies and local governments consider environmental factors when making decisions on activities, such as development proposals over a certain size and comprehensive plans. As part of this process, environmental documents are prepared and opportunities for public comment are provided.

Steep slope	Slopes of 40 ~~percent~~% gradient or steeper within a vertical elevation change of at least ten feet. A slope is delineated by establishing its toe and top, and is measured by averaging the inclination over at least ten feet of vertical relief. For the purpose of this definition: The toe of a slope is a distinct topographic break in slope that separates slopes inclined at less than 40% from slopes 40% or steeper. Where no distinct break exists, the toe of a steep slope is the lower-most limit of the area where the ground surface drops ten feet or more vertically within a horizontal distance of 25 feet; AND The top of a slope is a distinct topographic break in slope that separates slopes inclined at less than 40% from slopes 40% or steeper. Where no distinct break exists, the top of a steep slope is the upper-most limit of the area where the ground surface drops ten feet or more vertically within a horizontal distance of 25 feet.
Storage routing	A method to account for the attenuation of peak flows passing through a detention facility or other storage feature.
Storm drains	The enclosed conduits that transport surface and stormwater runoff toward points of discharge (sometimes called storm sewers).
Storm frequency	The time interval between major storms of predetermined intensity and volumes of runoff for which storm sewers and other structures are designed and constructed to handle hydraulically without surcharging and backflooding (~~,~~ e.g., a 2-year, 10-year or 100-year storm).
Storm sewer	A sewer that carries stormwater and surface water, street wash and other wash waters or drainage, but excludes sewage and industrial wastes. Also called a storm drain.
Stormwater	See SCC 30.91S.600. Runoff during and following precipitation and snowmelt events, including surface runoff, drainage, and interflow. ~~That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes and other features of a stormwater drainage system into a defined surface waterbody, or a constructed infiltration facility.~~
Stormwater drainage system	Constructed and natural features which function together as a system to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter stormwater.
Stormwater facility	A system of collecting, conveying, and storing stormwater runoff. Stormwater facilities include, but are not limited to, all stormwater conveyance systems and containment facilities including pipelines, channels, dikes, ditches, closed depressions, stormwater flow control

facilities, stormwater treatment facilities, erosion and sedimentation control facilities, and other drainage structures and appurtenances, both natural and artificial.

Stormwater site plan The comprehensive report containing all of the technical information and analysis necessary for regulatory agencies to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements. Contents of the Stormwater Site Plan will vary with the type and size of the project, and individual site characteristics. It includes a Stormwater Pollution Prevention Plan (SWPPP) and a Permanent Stormwater Control Plan (PSC Plan). Guidance on preparing a Stormwater Site Plan is contained in Chapter 3 of Volume I.

Strahler stream order See SCC 30.91S.637. The hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Two first-order streams flow together to form a second-order stream, two second-order streams combine to make a third-order stream, etc. (Strahler 1957). This ordering method starts at zero at each terminal segment, and proceeds towards the root stream. Each time a bifurcation node is encountered, if both daughter branches have the same order, then the order is increased by one, otherwise the largest order is used.

Stream gaging The quantitative determination of stream flow using gages, current meters, weirs, or other measuring instruments at selected locations. See Gaging station.

Streambanks The usual boundaries, not the flood boundaries, of a stream channel. Right and left banks are named facing downstream.

Stream See SCC 30.91S.640. Those areas where naturally occurring surface waters flow sufficiently to produce a defined channel or bed which demonstrates evidence of the passage of water including, but not limited to, bedrock channels, gravel beds, sand and silt beds and defined-channel swales. A defined channel or bed means a water course that is scoured by water or contains deposits of mineral alluvium. The channel or bed need not contain water during the entire year. Streams do not include water courses which were created entirely by artificial means, such as irrigation ditches, canals, roadside ditches or storm or surface water run-off features, unless the artificially created water course contains salmonids or conveys a stream that was naturally occurring prior to the construction of the artificially created water course.

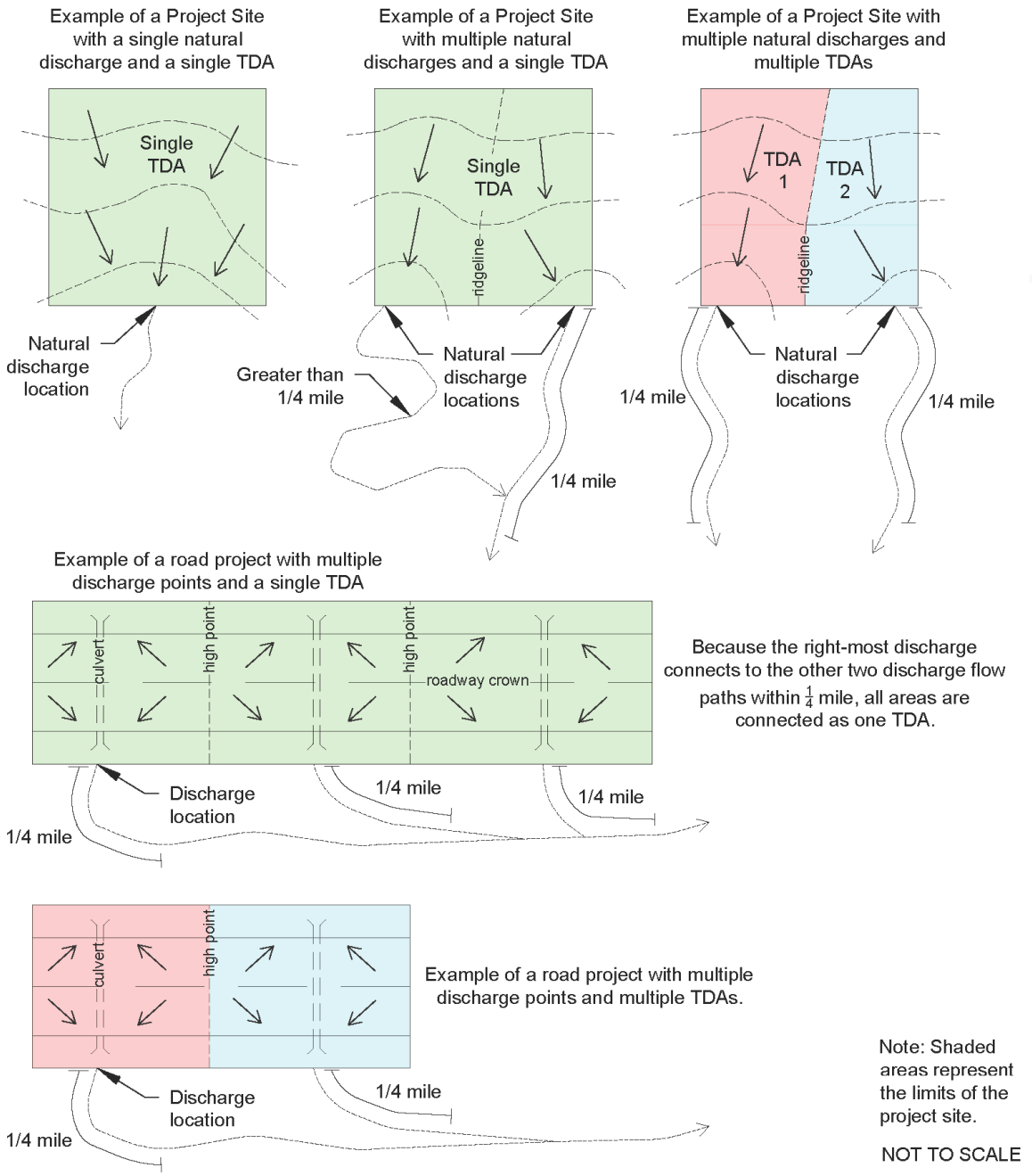
Structure A catchbasin or manhole in reference to a storm drainage system.

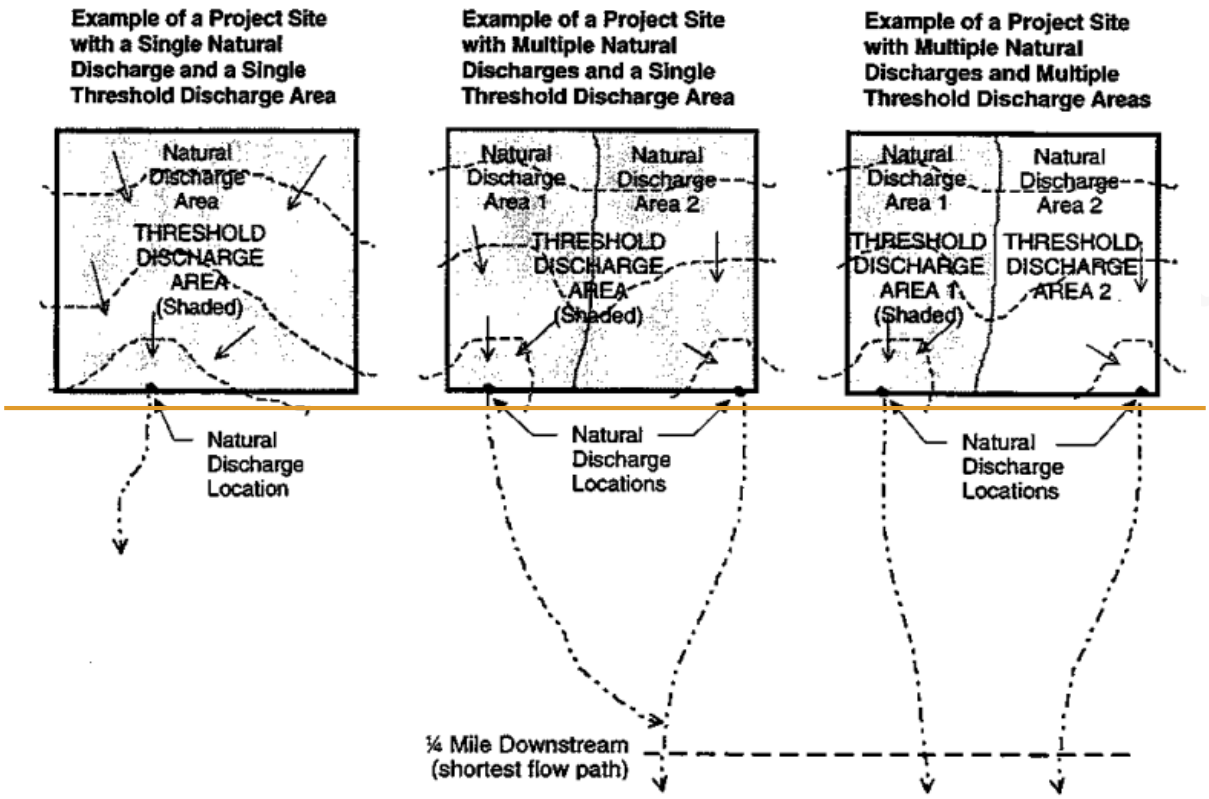
Structural source control BMPs	Physical, structural, or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. Structural source control BMPs typically include: • Enclosing and/or covering the pollutant source (building or other enclosure, a roof over storage and working areas, temporary tarp, etc.). • Segregating the pollutant source to prevent run-on of stormwater, and to direct only contaminated stormwater to appropriate treatment BMPs.
Stub-out	A short length of pipe provided for future connection to a storm drainage system.
Subbasin	A drainage area that drains to a water-course or waterbody named and noted on common maps and which is contained within a basin.
Subcatchment	A subdivision of a drainage basin (generally determined by topography and pipe network configuration).
Subdrain	A pervious backfilled trench containing stone or a pipe for intercepting ground water or seepage.
Subgrade	A layer of stone or soil used as the underlying base for a BMP.
Subsoil	The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below the plowed soil (or its equivalent of surface soil), in which roots normally grow. Although a common term, it cannot be defined accurately. It has been carried over from early days when "soil" was conceived only as the plowed soil and that under it as the "subsoil."
Substrate	The natural soil base underlying a BMP.
Surcharge	The flow condition occurring in closed conduits when the hydraulic grade line is above the crown of the sewer.
Surface water	See SCC 30.91S.760. Waters that flow over the land surface and frequently interact with groundwater.
Surface and stormwater	Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow ground water.

Surface and stormwater management system	Drainage facilities and any other natural features that collect, store, control, treat and/or convey surface and stormwater.
Suspended solids	Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles (and associated pollutants) as well as solids in stormwater.
Swale	A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than one foot.
Terrace	An embankment or combination of an embankment and channel across a slope to control erosion by diverting or storing surface runoff instead of permitting it to flow uninterrupted down the slope.
Threshold discharge area	See 30.91T.054B. An area within a project site draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). ~~An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream as determined by the shortest flowpath.~~ See the following figure for examples ~~below~~.

Examples of Threshold Discharge Area (TDA) Delineation

(Figure copied from 2019 Stormwater Management Manual for Western Washington)


Example of a Project Site with a single natural discharge and a single TDA
Single TDA
Natural discharge location
Example of a Project Site with multiple natural discharges and a single TDA
Single TDA
ridgeline
Greater than 1/4 mile
Natural discharge locations
1/4 mile
Example of a Project Site with multiple natural discharges and multiple TDAs
TDA 1
TDA 2
ridgeline
1/4 mile
Natural discharge locations
1/4 mile
Example of a road project with multiple discharge points and a single TDA
culvert
high point
high point
roadway crown
Because the right-most discharge connects to the other two discharge flow paths within 1/4 mile, all areas are connected as one TDA.
Discharge location
1/4 mile
1/4 mile
1/4 mile
culvert
high point
Example of a road project with multiple discharge points and multiple TDAs.
Discharge location
1/4 mile
1/4 mile
Note: Shaded areas represent the limits of the project site.
NOT TO SCALE



Tightline	A continuous length of pipe that conveys water from one point to another (typically down a steep slope) with no inlets or collection points in between.
Tile, Drain	Pipe made of burned clay, concrete, or similar material, in short lengths, usually laid with open joints to collect and carry excess water from the soil.
Tile drainage	Land drainage by means of a series of tile lines laid at a specified depth and grade.
Till	A layer of poorly sorted soil deposited by glacial action that generally has very low infiltration rates.
Time of concentration	The time period necessary for surface runoff to reach the outlet of a subbasin from the hydraulically most remote point in the tributary drainage area.
Timber	See SCC 30.91T.254. Forest trees, standing or down, of a commercial species, including Christmas trees. Timber does not include Christmas trees that are cultivated by agricultural methods, as that term is defined in RCW 84.33.035.
Topography	General term to include characteristics of the ground surface such as plains, hills, mountains, degree of relief, steepness of slopes, and other physiographic features.
Topsoil	Topsoil shall be per ASTM D5268 standard specification, and water permeability shall be 0.6 inches per hour or greater. Organic matter shall have not more than 10 ~~percent~~% of nutrients in mineralized water-soluble forms. Topsoil shall not have phytotoxic characteristics.
Total dissolved solids	The dissolved salt loading in surface and subsurface waters.
Total petroleum hydrocarbons (TPH)	TPH-Gx: The qualitative and quantitative method (extended) for volatile ("gasoline") petroleum products in water; and TPH-Dx: The qualitative and quantitative method (extended) for semi-volatile ("diesel") petroleum products in water.
Total solids	The solids in water, sewage, or other liquids, including the dissolved, filterable, and nonfilterable solids. The residue left when the moisture is evaporated and the remainder is dried at a specified temperature, usually 130°C.

Total suspended solids	That portion of the solids carried by stormwater that can be captured on a standard glass filter.
Toxic	Poisonous, carcinogenic, or otherwise directly harmful to life.
Tract	A legally created parcel of property designated for special nonresidential and noncommercial uses.
Trash rack	A structural device used to prevent debris from entering a spillway or other hydraulic structure.
Travel time	The estimated time for surface water to flow between two points of interest.
Treatment BMP	A BMP that is intended to remove pollutants from stormwater. A few examples of treatment BMPs are Wetponds, oil/water separators, biofiltration swales, and constructed wetlands.
Treatment liner	A layer of soil that is designed to slow the rate of infiltration and provide sufficient pollutant removal so as to protect groundwater quality.
Treatment train	A combination of two or more treatment facilities connected in series.
Turbidity	Dispersion or scattering of light in a liquid, caused by suspended solids and other factors; commonly used as a measure of suspended solids in a liquid.
Underdrain	Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration BMP, which are used to collect and remove excess runoff.
Undisturbed buffer	A zone where development activity shall not occur, including logging, and/or the construction of utility trenches, roads, and/or surface and stormwater facilities.
Undisturbed low gradient uplands	Forested land, sufficiently large and flat to infiltrate surface and storm runoff without allowing the concentration of water on the surface of the ground.
Unstable slopes	Those sloping areas of land which have in the past exhibited, are currently exhibiting, or will likely in the future exhibit, mass movement of earth.
Unusual biological	

community types	Assemblages of interacting organisms that are relatively uncommon regionally.
Urbanized area	Areas designated and identified by the U.S. Bureau of Census according to the following criteria: an incorporated place and densely settled surrounding area that together have a maximum population of 50,000.
U.S. EPA	The United States Environmental Protection Agency.
Values	Wetland processes or attributes that are valuable or beneficial to society (also see Functions). Wetland values include support of commercial and sport fish and wildlife species, protection of life and property from flooding, recreation, education, and aesthetic enhancement of human communities.
Vegetation	All organic plant life growing on the surface of the earth.
Vegetation or effective cover	Ground that has natural permanent growth sufficient to resist erosion during normal winter rainstorm events.
Vehicular use	Regular use of an impervious or pervious surface by motor vehicles. The following are subject to regular vehicular use: roads, un-vegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unrestricted access fire lanes, vehicular equipment storage yards, and airport runways. The following are not considered subject to regular vehicular use: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, restricted access fire lanes, and infrequently used maintenance access roads.
Waterbody	Surface waters including rivers, streams, lakes, marine waters, estuaries, and wetlands.
Water quality	See SCC 30.91W.025. The chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose.
Water quality design storm	The 24-hour rainfall amount with a 6-month return frequency. Commonly referred to as the 6-month, 24-hour storm.
Water quality	

standards	Minimum requirements of purity of water for various uses; for example, water for agricultural use in irrigation systems should not exceed specific levels of sodium bicarbonate, pH, total dissolved salts, etc. In Washington, the Department of Ecology sets water quality standards.
Watershed	A geographic region within which water drains into a particular river, stream, or body of water. Watersheds can be as large as those identified and numbered by the State of Washington Water Resource Inventory Areas (WRIAs) as defined in Chapter 173-500 WAC.
Water table	The upper surface or top of the saturated portion of the soil or bedrock layer, indicates the uppermost extent of ground water.
Weir	Device for measuring or regulating the flow of water.
Weir notch	The opening in a weir for the passage of water.
Wetland	An area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include, but are not limited to swamps, marshes, bogs, and similar areas, as well as artificial wetlands intentionally created from non-wetland areas to mitigate for conversion of wetlands, as permitted by the county. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to irrigation and drainage ditches, grass-lined biofiltration swales, canals, detention facilities, wastewater treatment facilities, farm ponds and landscaping amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. The detailed methodology for wetland delineation is contained in Washington State Wetlands Identification and Delineation Manual Washington State Department of Ecology, Publication #96-94, March 1997.
Wetland edge	Delineation of the wetland edge shall be based on the U.S. Army Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Miss. (1987)
Wetponds and Wetvaults	Drainage facilities for water quality treatment that contain permanent pools of water that are filled during the initial runoff from a storm event. They are designed to optimize water quality by providing retention time in order to settle out particles of fine sediment to which

	pollutants such as heavy metals absorb, and to allow biologic activity to occur that metabolizes nutrients and organic pollutants.
Wetpool	A pond or constructed wetland that stores runoff temporarily and whose normal discharge location is elevated so as to maintain a permanent pool of water between storm events.
Zoning	See SCC 30.91Z.030. The process by which the county legally controls the use of property and physical configuration of development upon tracts of land within its jurisdiction by establishing zones and adopting the zoning map. Zoning is an official control that implements the comprehensive plan and is enacted for the protection of the public health, safety and welfare.